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Volume-6

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State Service (Preliminary) Examination
Syllabus

PAPER-I GENERAL STUDIES

1. **History of India**
   - Concepts and Ideas - Ancient Indian Knowledge Tradition, Bharatvarsha, Vedas, Upanishad, Aranyaka, Brahman Granth, Shaddarshan, Smritiyan, Rit Sabha-Samiti, Gantantra(Republic), Varnashrama, Purushartha, Rin Sanskara, Panch Mahayagya/Yagya, Principle of Karma, Bodhisatva, Teerthankar.
   - Salient features, Events and their administrative, Social and Economic Systems of Ancient and Medieval India.
   - India's cultural heritage- Artforms, literature, festivals and events.
   - Social and Religious Reform Movements in 19th and 20th century.
   - Independence Struggle and Indian National Movement.
   - Integration and Reorganization of India after Independence.

2. **History, Culture and Literature of Madhya Pradesh**
   - Major Events and Major Dynasties of Madhya Pradesh.
   - Contribution of Madhya Pradesh in Freedom Movement.
   - Major Arts and Sculpture of Madhya Pradesh.
   - Major Tribes and Dialects of Madhya Pradesh.
   - Major Festivals, Folk Music, Folk Arts and Folk literature of Madhya Pradesh.
   - Important literary Creators of Madhya Pradesh and their Literary Creations.
   - Major Tourist Places of Religious, Cultural and Archaeological Importance in Madhya Pradesh.
   - World Heritage sites in Madhya Pradesh.
   - Important Tribal Personalities of Madhya Pradesh.

3. **Geography of India**
   - Mountains, Hills, Plateaus, Rivers and Lakes.
   - Climate phenomena- El Nino, La Nina, Southern Oscillation,Western Disturbance, Consequences of Climate Change.
   - Natural Resources – Forest, Minerals, Water Resources.
   - Major Crops, Food Security, Green Revolution, Strategies for the Second Green Revolution.

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- Conventional and Non-Conventional sources of energy.
- Natural hazards and disasters in India, Major cyclones in India.
- Population growth, distribution and Density, Rural-Urban Migration.

4. **Geography of Madhya Pradesh**
   - Forest, Forest Produce, Rivers, Hills and Plateaus.
   - Climate - Seasons, Temperature, Rainfall.
   - Natural Resources- Soils and Major Mineral resources.
   - Major Crops, Water Resources, Irrigation and Irrigation Projects.
   - Conventional and Non-Conventional Sources of Energy.
   - Major Industries of Madhya Pradesh.
   - Population Growth, Distribution and Density, Urbanisation.

5. **Constitutional System of India and Madhya Pradesh**
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   - Federal Executive, President and Parliament.
   - Supreme Court and Judicial System.
   - Constitutional Amendments.
   - Fundamental Rights and Duties of Citizens, Duties and Directive Principle of State.
   - National and Regional Constitutional/Statutory Commissions and Institutions.
   - Constitutional System of Madhya Pradesh (Governor, Cabinet, Legislative Assembly, High Court).
   - Three-Tier Panchayati Raj and Civil Administration system. in Madhya Pradesh
   - Good Governance in Madhya Pradesh (Governance System).

6. **Economy of India and Madhya Pradesh**
   - Corrent Situation of Madhya Pradesh in Indian Economy.
   - Population and Human Resources Development- Education, Health and Skills in Madhya Pradesh.
   - Progress in Sustainable Development Goals in Madhya Pradesh.
   - Development of Agriculture, Industry, MSME and Infrastructure Development in Madhya Pradesh.
   - Self-Reliant/Atma Nirbhar Madhya Pradesh, One District One Product (ODOP).
   - Progress of Intellectual Property Rights (IPR) in Madhya Pradesh.
   - Recent Trends in Indian Economy– Agriculture, Industry and Service sectors.
   - Financial Institutions– Reserve Bank, Commercial Banks, SEBI, Non-Banking Financial Institutions.
   - India's foreign Trade Policies G-20, SAARC and ASEAN.

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7. **Science, Environment and Health**
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   - Important Indian Scientific Research Institutions and their Achievements.
   - Setellite and Space Technology Achivment of India in the Field of Space Science.
   - Structure of Human Body.
   - Nutrition, Food, Nutrient and Malnutrition.
   - Genetic Disease, Sickle Cell Anemia- Cause, Effect, Diagonosis and Program.
   - Health Policy and Programmes, Infectious disease and its Prevention and Health Indicator.
   - Concept of Sustainable Development and SDG's.
   - Environmental Factors, Biodiversity and Ecosystem.
   - Pollution, Natural Calamities and Management.

8. **International, National and Current Events of Madhya Pradesh**
   - International Current Events.
   - National Current Events.
   - Current Events of Madhya Pradesh.

9. **Information and Communication Technology**
   - Basic Knowledge of Computer.
   - Electronics, Information and Communication Technology.
   - Robotics, Artificial Intelligence and Cyber Security.
   - E-Governance.
   - Internet and Social Networking Platforms.

10. **Tribes of Madhya Pradesh- Heritage, Folk Culture and Folk Literature**
    - The Geographical distribution of the Tribes in Madhya Pradesh, Constitutional Provisions Related to Tribes.
    - Major Tribes of Madhya Pradesh, Particularly Vulnerable Tribal Groups (PVTG) and Tribal Welfare Programs.
    - Tribal Culture of Madhya Pradesh- Customs, Traditions, Special Arts Festivals, Dialects and Literature.
    - Madhya Pradesh Tribals' Contribution to the Freedom Movement of India and Tribal Personalities of Madhya Pradesh, Important Institutes, Museums and Publications related to tribes of Madhya Pradesh.
    - Folk Culture and Literature of Madhya Pradesh.

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CHAPTER 01

Branches of Science and Scientific Awareness

1. The branch of chemistry that deals specifically with carbon compounds and their derivatives is known as:
(A) Inorganic Chemistry
(B) Physical Chemistry
(C) Analytical Chemistry
(D) Organic Chemistry

2. Who among the following is widely recognized as the Father of Botany?
(A) Aristotle
(B) Hippocrates
(C) Theophrastus
(D) Galen

3. Which of the following disciplines is considered a formal science rather than a natural science?
(A) Chemistry
(B) Biology
(C) Mathematics
(D) Geology

4. Identify the incorrect pair regarding microbes and their commercial uses.
(A) Yeast - Baking and brewing industry
(B) Lactobacillus - Production of curd
(C) Rhizobium - Extraction of petroleum products
(D) Penicillium - Production of antibiotics

5. Geology is fundamentally defined as the scientific study of:
(A) The scientific study of the earth's atmosphere, climate, and weather patterns
(B) The study of the solid earth, its composition, and its internal processes
(C) The observation of celestial bodies and the origin of the entire universe
(D) The physical, chemical, and biological properties of the world's seawater

6. The rapid advancement in computer science and information technology over the last few decades has primarily resulted in:
(A) The total elimination of the manufacturing sector
(B) The globalization of information and the digital revolution
(C) A decline in global life expectancy
(D) The stagnation of astronomical research

7. Which of the following best defines the fundamental nature of science?
(A) A static body of unchangeable facts and dogmas established by tradition
(B) A process of building knowledge through testable explanations and predictions
(C) A philosophical discipline relying primarily on personal intuition and logic
(D) An arbitrary collection of cultural beliefs and traditions passed down socially

8. Given below are two statements: one is labeled as Assertion (A) and the other is labeled as Reason (R).
Assertion (A): Meteorology plays a crucial role in modern agriculture.
Reason (R): Meteorologists study atmospheric phenomena to provide accurate weather forecasts, which help farmers plan their agricultural activities.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

9. The branch of biology that concerns the molecular basis of biological activity between biomolecules in the various systems of a cell is known as:

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(A) Ecology
(B) Molecular biology
(C) Taxonomy
(D) Morphology

10. Read the following statements and choose the correct option:
Statement I: Physical chemistry involves applying the principles of physics to chemical systems.
Statement II: Quantum mechanics has no application in modern chemistry.
Which of the following is correct?
(A) Statement I is true, Statement II is false
(B) Statement I is false, Statement II is true
(C) Both statements are true
(D) Both statements are false

11. Which of the following is a correct statement about agricultural science?
(A) A discipline solely concerned with the financial marketing of food crops
(B) A conservative field that rejects the use of modern biotechnology and genetics
(C) A narrow focus on animal husbandry that excludes the study of crop production
(D) An interdisciplinary field using multiple sciences to support agricultural practices

12. The broad division of natural science encompasses which of the following main branches?
(A) Social science and Formal science
(B) Mathematics and Logic
(C) Physical science and Life science
(D) Psychology and Sociology

13. Which statement is the most appropriate description of classical biology as compared to modern biology?
(A) The study of macroscopic observation, classification, and anatomy of organisms
(B) The research centered entirely on microscopic molecular and cellular processes
(C) The analysis of biological systems based heavily on genetic sequencing data
(D) The branch of biology exclusively concerned with modern bio-informatics tools

14. The expansion of the universe and the lifecycle of stars are phenomena studied under which specific branch of science?
(A) Meteorology
(B) Petrology
(C) Astrophysics
(D) Paleontology

15. The Indian Institute of Soybean Research, an important agricultural science institution, is located in which city of Madhya Pradesh?
(A) Bhopal
(B) Jabalpur
(C) Gwalior
(D) Indore

16. What is the primary difference between pure science and applied science?
(A) Pure science seeks knowledge without immediate application, while applied science solves practical problems
(B) Pure science focuses on specific practical challenges, while applied science targets theoretical foundations
(C) Pure science relies on advanced mathematical modeling, while applied science uses field observations
(D) Pure science is restricted to university laboratories, while applied science exists only in industries

17. A team of scientists is studying the impact of industrial effluents on a river ecosystem. They analyze the chemical toxins, observe the health of aquatic life, and assess changes in water flow. This approach best exemplifies which branch of science?
(A) Environmental science
(B) Pure mathematics
(C) Theoretical physics
(D) Classical taxonomy

18. Identify the incorrect statement regarding the branches of biology.
(A) Zoology focuses exclusively on the study of single-celled organisms
(B) Botany is the scientific study of plants
(C) Genetics is the study of heredity and variation in living organisms
(D) Ecology deals with the interactions among organisms and their environment

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19. Find the odd one out among the following sub-branches of zoology.
(A) Ornithology
(B) Entomology
(C) Ichthyology
(D) Mycology

20. The scientific study of ancient life, relying primarily on fossil records, is called:
(A) Paleontology
(B) Petrology
(C) Stratigraphy
(D) Mineralogy

21. The foundational binary system utilized in modern computer science relies on which two digits?
(A) 1 and 2
(B) 0 and 9
(C) 0 and 1
(D) A and B

22. Match the following lists regarding branches of physics and their fields of study:
List I: (Branches of Physics)
P. Acoustics
Q. Optics
R. Thermodynamics
S. Mechanics
List II: (Field of Study)
1. Study of heat and temperature
2. Study of motion and forces
3. Study of light and its properties
4. Study of sound and its transmission
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-1, S-2
(C) P-4, Q-3, R-2, S-1
(D) P-1, Q-2, R-3, S-4

23. Consider the following statements regarding the role of mathematics in science:
I. It provides a universal language for formulating scientific laws.
II. It is essential for statistical analysis of experimental data.
III. It is only applicable to physics and has no relevance in biological sciences.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

24. Read the following statements and choose the correct option:
Statement I: Biochemistry explores the chemical processes within and related to living organisms.
Statement II: Biochemistry focuses strictly on inorganic compounds and excludes carbon-based molecules.
Which of the following is correct?
(A) Statement I is true, Statement II is false
(B) Statement I is false, Statement II is true
(C) Both statements are true
(D) Both statements are false

25. Which of the following is not typically considered a sub-discipline of oceanography?
(A) Biological oceanography
(B) Atmospheric physics
(C) Physical oceanography
(D) Chemical oceanography

26. Which of the following is not an example of applied science?
(A) Medicine
(B) Engineering
(C) Agricultural Science
(D) Theoretical Astrophysics

27. Match the following lists regarding branches of medical science and their fields of study:
List I: (Branches of Medical Science)
P. Oncology
Q. Cardiology
R. Dermatology
S. Neurology
List II: (Field of Study)
1. Skin disorders
2. Nervous system disorders
3. Heart and blood vessels
4. Tumors and cancer
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-4, R-2, S-1
(C) P-1, Q-2, R-3, S-4
(D) P-4, Q-1, R-3, S-2

28. The working of a household refrigerator primarily demonstrates the practical application of which branch of physics?
(A) Thermodynamics
(B) Optics

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(C) Acoustics
(D) Electromagnetism

29. Consider the following fields of study within microbiology:
I. Bacteriology
II. Virology
III. Mycology
IV. Immunology
Which of the above statement(s) is/are correct regarding valid microbiological fields?
(A) I, II, III and IV are all valid microbiological fields
(B) Only I and II are valid microbiological fields
(C) Only I, II and III are valid microbiological fields
(D) Immunology is not related to microbiology in any way

30. Which of the following is a correctly matched pair?
(A) Seismology - Study of fossils
(B) Paleontology - Study of earthquakes
(C) Geomorphology - Study of the ocean floor
(D) Mineralogy - Study of minerals

31. Which of the following best describes the relationship between science and society?
(A) A relationship where science operates entirely independently of any societal values
(B) A hierarchy where society dictates the fundamental laws governing physical matter
(C) A mutual interaction where science shapes society and societal needs drive research
(D) A connection where scientific progress only negatively impacts human development

32. The discovery of the 'Raman Effect', for which an Indian scientist won the Nobel Prize, belongs to which branch of science?
(A) Biology
(B) Physics
(C) Chemistry
(D) Geology

33. The process by which a heavy atomic nucleus splits into two lighter nuclei, releasing a large amount of energy, is known as:
(A) Nuclear fusion
(B) Nuclear fission
(C) Alpha decay
(D) Gamma radiation

34. Which of the following is the most appropriate example of an interdisciplinary science?
(A) Euclidean Geometry
(B) Classical Mechanics
(C) Pure Algebra
(D) Biophysics

35. A statement based on repeated experimental observations that describes some aspect of the universe, often expressed mathematically (such as $E=mc^2$), is known as a:
(A) Scientific law
(B) Scientific hypothesis
(C) Scientific anomaly
(D) Pseudoscience

36. Identify the incorrect pair regarding nutrition science and deficiency diseases.
(A) Iodine - Night blindness
(B) Vitamin C - Scurvy
(C) Vitamin D - Rickets
(D) Iron - Anemia

37. Consider the following statements regarding the applications of nanotechnology:
I. Developing targeted drug delivery systems.
II. Creating stronger and lighter building materials.
III. Enhancing water purification techniques.
IV. Fabricating high-density memory storage devices.
V. Increasing the size of macro-processors.
Which combination represents correct applications of nanotechnology?
(A) I, II, III and V only
(B) I, II, III and IV only
(C) II, III, IV and V only
(D) I, III, IV and V only

38. Match the following lists regarding scientists and their discoveries/inventions:
List I: (Scientists)
P. Alexander Fleming
Q. Albert Einstein
R. Marie Curie
S. Isaac Newton
List II: (Discoveries/Inventions)
1. Theory of Relativity

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2. Penicillin
3. Laws of Motion
4. Radium and Polonium

(A) P-1, Q-2, R-3, S-4
(B) P-4, Q-3, R-2, S-1
(C) P-2, Q-4, R-1, S-3
(D) P-2, Q-1, R-4, S-3

39. The fundamental scientific principle behind the heating of food in a microwave oven is the:
(A) Conduction of heat from the air to the food
(B) Nuclear fusion of hydrogen atoms in the food
(C) Release of chemical energy through combustion
(D) Excitation of water molecules by electromagnetic radiation

40. Read the following statements and choose the correct option:
Statement I: The scientific method relies on empirical evidence and measurable data.
Statement II: A scientific theory is a completely unverified assumption with no experimental backing.
Which of the following is correct?
(A) Statement I is true, Statement II is false
(B) Statement I is false, Statement II is true
(C) Both statements are true
(D) Both statements are false

41. In the context of sports science, the illicit use of performance-enhancing drugs (doping) primarily causes:
(A) The development of permanent immunity to all known pathogenic viral diseases
(B) Long-term health risks including damage to the cardiovascular system and liver
(C) A significant and measurable increase in the natural biological lifespan of the athlete
(D) A consistent and predictable decrease in the red blood cell count in every case

42. Which of the following is not considered a peaceful application of nuclear science?
(A) Generation of electricity via nuclear reactors
(B) Production of radioisotopes for cancer treatment
(C) Development of nuclear warheads for strategic deterrence
(D) Use of neutron activation analysis in archaeology

43. Find the odd one out in the context of scientific awareness versus superstition.
(A) Solar eclipses are caused by the moon passing between the sun and the earth
(B) The alignment of planets determines individual human destiny and personality
(C) Diseases are caused by pathogenic microorganisms
(D) Earthquakes occur due to the sudden release of energy in the Earth's lithosphere

44. Which of the following is a correct pair regarding scientific observation?
(A) Qualitative observation - Measuring the exact weight of a chemical
(B) Quantitative observation - Noting the color change in a reaction
(C) Qualitative observation - Measuring the volume of a liquid in milliliters
(D) Quantitative observation - Recording the temperature as 45 degrees Celsius

45. The technique of DNA fingerprinting, crucial in modern forensic science, was developed by:
(A) James Watson
(B) Gregor Mendel
(C) Alec Jeffreys
(D) Louis Pasteur

46. Biotechnology is best defined as:
(A) The comprehensive study of the biomechanics and movement of the human body
(B) The use of biological systems and organisms to develop or make products
(C) The technological research of all abiotic components within a natural ecosystem
(D) The utilization of complex computer software to map global geographical topographies

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47. Read the following statements and choose the correct option:
Statement I: Traditional knowledge systems like Ayurveda have historical roots in empirical observations of medicinal plants.
Statement II: Modern pharmacology completely ignores plant-based compounds discovered in traditional medicine.

Which of the following is correct?
(A) Statement I is true, Statement II is false
(B) Statement I is false, Statement II is true
(C) Both statements are true
(D) Both statements are false

48. In the scientific method, an educated guess or a proposed explanation made on the basis of limited evidence as a starting point for further investigation is called a:
(A) Scientific law
(B) Hypothesis
(C) Scientific theory
(D) Conclusion

49. Which of the following was not a contribution of ancient Indian classical science?
(A) The heliocentric model proposed by Copernicus
(B) The concept of zero as a number
(C) Ayurvedic system of medicine
(D) Calculation of the approximate value of pi by Aryabhata

50. The robust development of science and technology in a nation primarily leads to:
(A) Decreased agricultural yield
(B) Stagnation in industrial output
(C) Economic growth, improved healthcare, and enhanced national security
(D) Complete eradication of cultural heritage

51. Which of the following is a correct statement regarding sports science?
(A) A field that relies solely on psychology and ignores any physiological data
(B) A discipline that actively discourages the use of nutrition in athlete recovery
(C) A branch of medicine that has no relevance to sports injury prevention methods
(D) The study of human movement through biomechanics to improve athletic performance

52. Identify the correct statement regarding India's Science, Technology and Innovation (STI) Policy 2020.
(A) It aims to completely ban the participation of the private sector in all scientific research
(B) It discourages international scientific collaborations and focuses on isolationist policies
(C) It solely focuses on agricultural technologies while ignoring space and nuclear sciences
(D) It builds a decentralized, evidence-informed, and bottom-up national STI ecosystem

53. Select the correct sequential order of the fundamental steps in the scientific method.
(A) Observation → Hypothesis → Experiment → Analysis → Conclusion
(B) Hypothesis → Observation → Conclusion → Experiment → Analysis
(C) Experiment → Analysis → Hypothesis → Observation → Conclusion
(D) Conclusion → Hypothesis → Observation → Analysis → Experiment

54. A scientific field that involves drawing appropriately from multiple academic disciplines to redefine problems outside normal boundaries and reach solutions based on a new understanding of complex situations is termed:
(A) Monodisciplinary
(B) Pseudoscientific
(C) Interdisciplinary
(D) Unorthodox

55. Which autonomous organization under the Department of Science and Technology, Government of India, was primarily established to promote and popularize science among the public?
(A) Vigyan Prasar
(B) ISRO
(C) DRDO
(D) ICAR

56. Find the odd one out among the following fields related to materials science.
(A) Psychiatry
(B) Metallurgy
(C) Ceramics
(D) Polymer science

57. Arrange the following steps of a forensic crime scene investigation in the correct logical sequence:
1. Laboratory analysis of collected evidence
2. Securing and isolating the crime scene
3. Presenting findings in a court of law
4. Systematically photographing and

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documenting the scene
5. Collecting and packaging physical evidence
(A) 2, 4, 5, 1, 3
(B) 4, 2, 5, 1, 3
(C) 2, 5, 4, 1, 3
(D) 5, 2, 4, 3, 1

58. Identify the incorrect statement regarding the scientific method.
(A) It relies on dogmatic acceptance of authority without questioning
(B) It involves systematic observation and experimentation
(C) Results must be reproducible by other researchers
(D) Data analysis is a crucial step before forming a conclusion

59. Consider the following statements regarding ancient Indian classical science:
I. Sushruta is known as the father of ancient Indian surgery.
II. Aryabhata explained the causes of solar and lunar eclipses scientifically.
III. Charaka authored a fundamental text on ancient Indian medicine.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

60. In a scientific experiment testing the efficacy of a new fertilizer, one group of plants receives the fertilizer while another group receives only water. The group receiving only water serves as the:
(A) Experimental group
(B) Control group
(C) Dependent variable
(D) Confounding variable

61. The term "Biology" was independently introduced in the early 19th century by which of the following scientists?
(A) Charles Darwin and Gregor Mendel
(B) Louis Pasteur and Robert Koch
(C) Jean-Baptiste Lamarck and Gottfried Reinhold Treviranus
(D) Antonie van Leeuwenhoek and Robert Hooke

62. Find the odd one out among the following computer science and IT concepts.
(A) Motherboard
(B) Operating System
(C) Compiler
(D) Application Software

63. Find the odd one out among the following sciences based on their core methodology.
(A) Experimental Chemistry
(B) Logic
(C) Theoretical Computer Science
(D) Mathematics

64. A botanist hypothesizes that increased sunlight accelerates plant growth. To test this, the most appropriate scientific step is to:
(A) Write a review article on sunlight and plants
(B) Observe a single plant in the dark and record its height
(C) Set up an experiment with identical plants exposed to varying amounts of sunlight while keeping water and soil constant
(D) Debate the hypothesis with other botanists without gathering data

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65. Identify the incorrect statement regarding the classification in classical biology.
(A) Archaea and Bacteria are classified under the exact same domain in modern taxonomy
(B) Carolus Linnaeus is known as the father of modern taxonomy
(C) Binomial nomenclature uses two terms to denote a species of living organism
(D) Genus is a taxonomic rank that comes above species

66. Which prestigious award is given in India for outstanding contributions to science popularization and communication among the masses?
(A) NCSTC National Award for Science Popularization
(B) Shanti Swarup Bhatnagar Prize
(C) Kalinga Prize (awarded by UNESCO, often won by Indians)
(D) Sahitya Akademi Award

67. The development of a new vaccine for a viral outbreak is best categorized as an achievement in:

(A) Pure theoretical physics
(B) Paleobotany
(C) Applied medical science
(D) Astronomy

68. Given below are two statements: one is labeled as Assertion (A) and the other is labeled as Reason (R).
Assertion (A): Biotechnology has significantly improved agricultural yields in the 21st century.
Reason (R): Genetic engineering techniques have allowed for the development of crops that are resistant to pests and tolerant to herbicides.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

69. India's science and technology policy has historically emphasized self-reliance. Which of the following is an exception and represents a non-scientific or pseudoscientific approach?
(A) Replacing modern medicine with untested healing practices in national policy
(B) The continuous investment in developing indigenous satellite launch vehicles
(C) The national promotion of the strategic three-stage nuclear power programme
(D) The historical establishment of the Council of Scientific and Industrial Research

70. Which of the following is a correctly matched pair of astronomical instrument and its primary function?
(A) Spectroscope - Measuring the distance of a star directly
(B) Barometer - Observing distant galaxies in visible light
(C) Radio Telescope - Detecting radio frequency radiation emitted by extraterrestrial sources
(D) Seismograph - Tracking the movement of comets

71. Identify the correct statement regarding the Indian Constitution and scientific awareness.
(A) The citizen's duty to develop scientific temper, humanism, and inquiry
(B) The explicit prohibition of teaching modern science within all rural schools
(C) The constitutional mandate that astrology be taught alongside university astronomy
(D) The regulation of research as a state subject where the union has no role

72. Read the following statements regarding physics and choose the correct option:
Statement I: Classical mechanics is highly effective at describing the motion of macroscopic objects at everyday speeds.
Statement II: Quantum mechanics is required to describe the behavior of matter and energy at the atomic and subatomic levels.
Which of the following is correct?
(A) Statement I is true, Statement II is false
(B) Statement I is false, Statement II is true
(C) Both statements are true
(D) Both statements are false

73. Which of the following is a correct statement regarding the medical science branch of epidemiology?
(A) The branch of surgery dealing only with the treatment of bone fractures
(B) The microscopic study involving only the individual layers of human skin
(C) A form of alternative medicine relying exclusively on traditional herbal remedies
(D) The study of the distribution and determinants of health states in populations

74. Who among the following is widely considered the Father of Microbiology for his pioneering work in observing single-celled organisms using handcrafted microscopes?
(A) Edward Jenner
(B) Alexander Fleming
(C) Antonie van Leeuwenhoek
(D) Jonas Salk

75. Identify the incorrect pair of Indian scientist and their primary field of contribution.
(A) Homi J. Bhabha - Nuclear Physics
(B) Vikram Sarabhai - Space Research
(C) M.S. Swaminathan - Agricultural Science
(D) S.N. Bose - Evolutionary Biology

76. Empirical evidence, which is the foundation of the scientific method, refers to:
(A) Assumptions based on philosophical debates

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(B) Data derived purely from mathematical axioms without physical testing
(C) Knowledge passed down through oral folklore
(D) Information acquired by observation or experimentation

77. In the context of the scientific method, a scientific law is best defined as:
(A) A legislative rule created by the government to regulate academic research
(B) An unverified theoretical explanation proposed for a complex natural event
(C) A preliminary hypothesis that has failed rigorous experimental testing
(D) A universal description of an observed phenomenon under specific conditions

78. Which of the following is not considered a branch of earth sciences?
(A) Geophysics
(B) Glaciology
(C) Climatology
(D) Cosmology

79. Read the following statements regarding materials science and nanotechnology and choose the correct option:
Statement I: Nanotechnology generally deals with structures sized between 1 to 100 nanometers.
Statement II: At the nanoscale, materials often exhibit physical and chemical properties entirely different from their bulk counterparts.
Which of the following is correct?
(A) Statement I is true, Statement II is false
(B) Statement I is false, Statement II is true
(C) Both statements are true
(D) Both statements are false

80. While ecology focuses specifically on the interactions between organisms and their environment, environmental science is broader because it:
(A) The study focusing only on physical environments without any biological elements
(B) A specialized field that strictly excludes the study of complex ecosystems
(C) A discipline that deals exclusively with environments found in outer space
(D) The integration of ecology with human impact, policy, and other physical sciences

81. The active promotion of a "scientific temper" in society primarily aims to cause:
(A) An increase in blind faith
(B) The restriction of artistic expressions
(C) The eradication of superstitions and the fostering of rational thinking
(D) A decline in philosophical studies

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82. Match the following lists regarding branches of chemistry and their focus areas:
List I: (Branches of Chemistry)
P. Analytical Chemistry
Q. Biochemistry
R. Inorganic Chemistry
S. Physical Chemistry
List II: (Focus Area)
1. Chemical processes in living things
2. Properties and behavior of chemical systems using physics
3. Compounds not containing carbon-hydrogen bonds
4. Separation, identification, and quantification of matter
(A) P-4, Q-1, R-3, S-2
(B) P-1, Q-2, R-4, S-3
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-3, R-2, S-1

83. Consider the following parameters studied in oceanography:
I. Ocean currents and waves
II. Marine ecosystems and life forms
III. Tectonic plate movements of the ocean floor
IV. Chemical composition of seawater
Which combination of the above parameters falls under the scope of oceanography?
(A) I and II only
(B) II, III and IV only
(C) I, III and IV only
(D) I, II, III and IV

84. National Science Day is celebrated in India on February 28 every year to commemorate:
(A) The birthday of Dr. A.P.J. Abdul Kalam
(B) The successful launch of Aryabhata satellite
(C) The discovery of the Raman Effect by Sir C.V. Raman
(D) The Pokhran-II nuclear tests

85. The R.A.K. College of Agriculture, a premier institute contributing to agricultural science in Madhya Pradesh, is situated in:
(A) Ujjain
(B) Rewa
(C) Sehore
(D) Satna

86. A researcher spends ten years studying the mating rituals of a rare species of deep-sea squid with no immediate intention of using this knowledge for commercial gain. This is an example of:
(A) Applied science
(B) Pure/Basic science
(C) Forensic science
(D) Pseudoscientific research

87. Match the following lists regarding specialized branches of science and their subjects of study:
List I: (Specialized Branch of Science)
P. Mycology
Q. Oology
R. Virology
S. Entomology
List II: (Subject of Study)
1. Insects
2. Viruses
3. Fungi
4. Bird eggs
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-4, R-2, S-1
(C) P-3, Q-1, R-2, S-4
(D) P-2, Q-4, R-3, S-1

88. The study of meteors and asteroids in outer space
(A) The study of meteors and asteroids in outer space
(B) The scientific study of the atmosphere that focuses on weather processes and forecasting
(C) The measurement of metallic ores in the Earth's crust
(D) The study of ancient climate patterns through ice cores

89. Consider the following applications of nuclear technology:
I. Generating electricity via pressurized water reactors
II. Using Cobalt-60 for cancer radiotherapy
III. Enhancing crop varieties using radiation-induced mutations
IV. Using Carbon-14 for dating archaeological artifacts
V. Manufacturing intercontinental ballistic missiles
Which combination represents the peaceful uses of nuclear science?
(A) I, II, III and V only
(B) I, II, III and IV only
(C) II, III, IV and V only
(D) I, III, IV and V only

90. In biochemistry, the malfunction of specific metabolic pathways due to genetic mutations primarily results in:
(A) Metabolic disorders or diseases
(B) Enhanced physical strength
(C) The formation of new beneficial organs
(D) Immunity against all bacterial infections

91. The branch of physics that applies the laws of physics and chemistry to explain the birth, life, and death of stars, planets, galaxies, and nebulae is known as:
(A) Astrometry
(B) Astrophysics
(C) Cosmology
(D) Quantum gravity

92. Find the odd one out among the following interdisciplinary scientific fields.
(A) Biochemistry
(B) Geophysics
(C) Astrobiology
(D) Classical Thermodynamics

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93. Select the correct sequential order of the evolution of communication technology driven by science.
(A) Telegraph → Telephone → Radio → Optical Fiber → Satellite Internet
(B) Radio → Telegraph → Telephone → Satellite Internet → Optical Fiber
(C) Telephone → Telegraph → Radio → Optical Fiber → Satellite Internet
(D) Telegraph → Radio → Telephone → Satellite Internet → Optical Fiber

94. Which of the following is not considered a valid property of the scientific method?
(A) Falsifiability
(B) Reproducibility
(C) Subjectivity
(D) Objectivity

95. In sports nutrition science, which class of macronutrients is primarily recommended for rapid glycogen replenishment immediately after intense endurance exercise?
(A) Carbohydrates
(B) Fats
(C) Proteins
(D) Vitamins

96. The ancient Indian text 'Charaka Samhita' is a foundational treatise primarily associated with which branch of knowledge?
(A) Metallurgy
(B) Medicine (Ayurveda)
(C) Architecture
(D) Mathematics

97. Which of the following is a correctly matched pair of a scientific measuring instrument and its use?
(A) Anemometer - Measuring wind speed
(B) Hygrometer - Measuring atmospheric pressure
(C) Lactometer - Measuring the magnitude of earthquakes
(D) Pyrometer - Measuring the depth of the ocean

98. Arrange the following levels of biological organization in the correct ascending order of complexity:
1. Tissue
2. Cell
3. Organism
4. Organ system
5. Organ

(A) 2, 1, 5, 4, 3
(B) 1, 2, 5, 4, 3
(C) 2, 1, 4, 5, 3
(D) 5, 4, 1, 2, 3

99. Read the following statements regarding forensic entomology and choose the correct option:
Statement I: It involves the study of insects and their developmental stages to estimate the time of death in criminal investigations.
Statement II: It relies heavily on principles of zoology and ecology.
Which of the following is correct?
(A) Statement I is true, Statement II is false
(B) Statement I is false, Statement II is true
(C) Both statements are true
(D) Both statements are false

100. The ultimate goal of applied scientific research is most appropriately described as:
(A) Generating abstract philosophical debates without any real-world constraints
(B) Discovering fundamental forces of nature strictly for the sake of knowledge
(C) Categorizing and memorizing historical scientific texts without new analysis
(D) Solving practical problems to improve human life and technology

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ANSWERS

1. (D) Organic Chemistry
Organic chemistry is the scientific study of the structure, properties, composition, reactions, and preparation of carbon-containing compounds. Most organic compounds contain carbon and hydrogen, but they may also include any number of other elements like nitrogen, oxygen, halogens, or sulfur. This branch is essential for modern medicine, plastics, and various chemical materials used globally.

2. (C) Theophrastus
Theophrastus is universally recognized as the father of botany due to his major works on plants. His books, such as Enquiry into Plants and On the Causes of Plants, provided the most significant contribution to botanical science during antiquity. He classified plants based on their reproduction and growth, establishing the foundation of systematic plant science for future generations.

3. (C) Mathematics
Mathematics is classified as a formal science because it deals with abstract structures and logical reasoning rather than empirical observation of the natural world. Unlike biology or geology, which study physical phenomena, formal sciences focus on systems of axioms and rules. These disciplines provide the logical framework and language used by natural scientists to formulate their own laws.

4. (C) Rhizobium - Extraction of petroleum products
Rhizobium is a genus of bacteria associated with the root nodules of legumes, where they perform nitrogen fixation. This biological process converts atmospheric nitrogen into ammonia, which plants can use for growth. They are not involved in the extraction of petroleum products, which is a geological process. Other pairs correctly identify microbes and their commercial industrial applications.

5. (B) The study of the solid earth, its composition, and its internal processes
Geology focuses on the physical structure and substance of the earth, its history, and the processes that act on it. This includes the study of rocks, minerals, and the tectonic movements that shape the planet's surface. Understanding these internal and external processes helps scientists predict natural disasters and find valuable resources located within the earth's crust.

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6. (B) The globalization of information and the digital revolution
The rapid progress in computer science and information technology has fundamentally altered how society functions by enabling instant global communication. This digital revolution has facilitated the widespread sharing of knowledge and data across borders. It has transformed industries, improved connectivity, and created a more integrated global economy through the use of advanced networks and digital computing tools.

7. (B) A process of building knowledge through testable explanations and predictions
Science is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe. It relies on empirical evidence gathered through observation and experimentation. This iterative process allows scientific theories to be refined or replaced when new data emerges, ensuring a dynamic and evidence-based understanding of reality and natural phenomena.

8. (A) Both A and R are true and R is the correct explanation of A.
Meteorology is the scientific study of the atmosphere and its phenomena, particularly for weather forecasting. In agriculture, accurate weather predictions are vital for farmers to make informed decisions regarding irrigation, sowing, and harvesting. By understanding atmospheric patterns, meteorologists help minimize crop loss and optimize agricultural productivity through

timely and accurate warnings about impending weather changes.

9. (B) Molecular biology
Molecular biology is the field of biology that studies the molecular basis of biological activity within and between cells. This includes molecular synthesis, modification, mechanisms, and interactions. It focuses on how molecules like DNA, RNA, and proteins interact to perform essential functions, providing a deeper understanding of the fundamental processes of life at the most basic level.

10. (A) Statement I is true, Statement II is false
Physical chemistry is a branch of chemistry that applies the theories and techniques of physics to the study of chemical systems. It covers topics like thermodynamics and kinetics. Contrary to the second statement, quantum mechanics is foundational to modern chemistry, explaining the behavior of atoms and molecules and their bonding properties in various complex chemical reactions and structures.

11. (D) An interdisciplinary field using multiple sciences to support agricultural practices
Agricultural science is a broad multidisciplinary field of biology that encompasses parts of exact, natural, economic, and social sciences used in agriculture. It incorporates elements of genetics, soil science, chemistry, and meteorology to improve crop yields, enhance food security, and ensure sustainable farming. This integration of diverse scientific knowledge is necessary to meet global food production demands.

12. (C) Physical science and Life science
Natural science is broadly divided into two main branches, which are physical science and life science. Physical science investigates the non-living world and includes disciplines like physics, chemistry, astronomy, and earth sciences. Life science, or biology, focuses on the study of living organisms, their internal structures, and their interactions with the environment and each other over time.

13. (A) The study of macroscopic observation, classification, and anatomy of organisms
Classical biology focuses on the macroscopic level of life, involving the observation, description, and classification of whole organisms and their internal structures. This traditional approach relies on visible features and anatomical dissection. In contrast, modern biology often deals with the microscopic and molecular levels, utilizing advanced technology to study genes, cellular processes, and complex biochemical pathways in detail.

14. (C) Astrophysics
Astrophysics is the branch of astronomy that employs the principles of physics and chemistry to ascertain the nature of astronomical objects. It investigates phenomena such as the lifecycle of stars, the expansion of the universe, and the behavior of galaxies. This field seeks to understand the physical properties, evolution, and ultimate fate of the entire cosmos using scientific laws.

15. (D) Indore
The Indian Institute of Soybean Research is a premier national institute located in Indore, Madhya Pradesh. It functions under the Indian Council of Agricultural Research and focuses on soybean improvement and production technology. The institute plays a critical role in enhancing soybean productivity in India, which is essential for the country's oilseed economy and overall food security.

16. (A) Pure science seeks knowledge without immediate application, while applied science solves practical problems
Pure science is driven by curiosity and the desire to expand human knowledge of the natural world through fundamental research. Applied science uses the knowledge gained from pure science to develop practical solutions for specific problems. While pure science provides the theoretical foundation, applied science focuses on creating useful tools, technologies, and medical treatments that benefit human society.

17. (A) Environmental science
Environmental science is an interdisciplinary field that integrates physical, biological, and information sciences to study the environment and find solutions to environmental problems. Analyzing the impact of industrial waste on a river ecosystem involves chemistry, biology, and ecology. This comprehensive approach is

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necessary to understand human impact and develop effective strategies for environmental conservation and ecosystem restoration.

18. (A) Zoology focuses exclusively on the study of single-celled organisms
Zoology is the branch of biology that studies the animal kingdom, including the structure, embryology, evolution, classification, habits, and distribution of all animals. It covers a vast range of organisms, from microscopic invertebrates to large mammals. Restricting its scope only to single-celled organisms is incorrect, as it encompasses all members of the Animalia kingdom regardless of complexity.

19. (D) Mycology
Mycology is the branch of biology concerned with the study of fungi, including their genetic and biochemical properties. Ornithology, entomology, and ichthyology are sub-branches of zoology, focusing on birds, insects, and fish, respectively. Since fungi belong to a separate biological kingdom from animals, mycology is not a sub-discipline of zoology, making it the outlier among the options.

20. (A) Paleontology
Paleontology is the scientific study of life that existed prior to the start of the Holocene epoch. It uses fossils to determine the evolution of organisms and their interactions with each other and their environments. This field combines geology and biology to reconstruct the history of life on Earth over millions of years, providing insights into ancient ecosystems.

21. (C) 0 and 1
The binary system is a base-2 numeral system that uses only two digits, typically zero and one. In computer science, these digits represent the two states of an electronic switch, usually off and on. All digital data and complex computations in modern computers are ultimately processed and stored using this fundamental binary logic and electrical signal variation.

22. (B) P-4, Q-3, R-1, S-2
Physics is divided into several branches based on the phenomena studied. Acoustics focuses on the production and transmission of sound. Optics is dedicated to the study of light and its properties. Thermodynamics explores the relationship between heat, work, and temperature. Mechanics is the study of motion and the forces that influence that motion in various physical systems.

23. (A) I and II only
Mathematics serves as a vital tool in science, providing a universal language for articulating scientific laws and models. It is also indispensable for the statistical analysis of data collected during experiments to ensure accuracy and reliability. However, it is highly relevant in biological sciences for modeling populations and genetics, making the third statement about its irrelevance false.

24. (A) Statement I is true, Statement II is false
Biochemistry is the study of chemical processes within and relating to living organisms. It combines biology and chemistry to explore how life functions at a molecular level. The second statement is incorrect because biochemistry specifically focuses on carbon-based molecules like proteins, lipids, and nucleic acids, which are the fundamental building blocks of all living matter and biological systems.

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25. (B) Atmospheric physics
Oceanography is divided into various sub-disciplines including biological, physical, and chemical oceanography, which study marine life, ocean currents, and seawater composition, respectively. While atmospheric physics is related to meteorology and climate, it is not considered a primary sub-discipline of oceanography itself. Oceanography focuses specifically on the physical, chemical, and biological properties of the world's vast oceans.

26. (D) Theoretical Astrophysics
Theoretical astrophysics is primarily concerned with understanding the fundamental laws of the universe and the nature of celestial objects through mathematical models. It is considered a pure science because its main goal is to expand knowledge rather than provide immediate practical solutions. Medicine, engineering, and agricultural science are applied sciences that focus on solving specific human challenges.

27. (A) P-4, Q-3, R-1, S-2
Medical science includes specialized fields such as oncology, which focuses on the diagnosis and treatment of tumors and cancer. Cardiology deals with the study and treatment of disorders involving the heart and blood vessels. Dermatology is the branch concerned with skin conditions. Neurology focuses on the diagnosis and treatment of all categories of complex nervous system disorders and diseases.

28. (A) Thermodynamics
A household refrigerator operates based on the principles of thermodynamics, specifically the second law. It uses a cycle of evaporation and condensation of a refrigerant to transfer heat from the inside of the unit to the outside environment. This process maintains a low temperature inside by removing thermal energy, demonstrating a practical application of heat transfer and energy conversion.

29. (A) I, II, III and IV are all valid microbiological fields
Microbiology is a broad field that encompasses several sub-disciplines. Bacteriology focuses on bacteria, virology on viruses, and mycology on fungi. Immunology is also considered a critical part of microbiology as it studies the immune system's response to microorganisms. All these fields are interconnected and essential for understanding microbial life and its profound impact on health and the environment.

30. (D) Mineralogy - Study of minerals
Mineralogy is the scientific study of the chemistry, crystal structure, and physical properties of minerals and artifacts. Seismology is the study of earthquakes, while paleontology is the study of fossils. Geomorphology focuses on the origin and evolution of topographic features on the earth's surface. Therefore, only the pair matching mineralogy with the study of minerals is factually correct.

31. (C) A mutual interaction where science shapes society and societal needs drive research
The relationship between science and society is characterized by mutual interaction and influence. Scientific discoveries lead to technological advancements that change how society functions and lives. Conversely, the needs and challenges of society often dictate the direction and funding of scientific research. This dynamic ensures that scientific progress addresses human problems while shaping the future of global civilization.

32. (B) Physics
The Raman Effect, discovered by Sir C.V. Raman, is a phenomenon in physics where light is scattered by molecules, leading to a change in its wavelength. This discovery provided significant evidence for the quantum nature of light and earned him the Nobel Prize in Physics in 1930. It remains a vital tool in spectroscopy for identifying various chemical substances.

33. (B) Nuclear fission
Nuclear fission is a process in which the nucleus of a heavy atom, such as uranium or plutonium, splits into two or more smaller nuclei. This reaction releases a significant amount of energy along with neutrons and gamma rays. It is the fundamental principle used in nuclear power plants to generate electricity and in certain types of nuclear devices.

34. (D) Biophysics
Biophysics is an interdisciplinary science that applies the approaches and methods of physics to study biological systems. It bridges the gap between the laws governing the physical world and the complex processes of life. Unlike pure mathematics or classical mechanics, biophysics requires the integration of knowledge from multiple scientific fields to understand phenomena like molecular motors and nerve impulses.

35. (A) Scientific law
A scientific law is a statement based on repeated experimental observations that describes some aspects of the universe. It often takes the form of a mathematical equation, like $E=mc^2$, which relates energy and mass. Laws describe what happens under certain conditions but do not explain why they happen, which is typically the role of a well-supported scientific theory.

36. (A) Iodine - Night blindness
Vitamin A deficiency is the primary cause of night blindness, a condition where it is difficult to see in low light. Iodine is an essential mineral

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for the production of thyroid hormones, and its deficiency leads to conditions like goitre. The other options correctly match Vitamin C with scurvy, Vitamin D with rickets, and iron with anemia respectively.

37. (B) I, II, III and IV only
Nanotechnology involves manipulating matter at the atomic or molecular scale to create new materials and devices. Its applications include targeted drug delivery, developing lightweight and strong materials, improving water filtration, and creating high-density memory storage. However, nanotechnology typically aims to decrease the size of components, so increasing the size of macro-processors is not a relevant or intended application.

38. (D) P-2, Q-1, R-4, S-3
Alexander Fleming discovered the first antibiotic, penicillin. Albert Einstein developed the theory of relativity, which revolutionized our understanding of space and time. Marie Curie is famous for her research on radioactivity and the discovery of radium and polonium. Isaac Newton formulated the laws of motion and universal gravitation, which laid the foundation for classical mechanics and engineering principles.

39. (D) Excitation of water molecules by electromagnetic radiation
A microwave oven heats food by emitting microwave radiation that is absorbed by water molecules and other polarized molecules in the food. This absorption causes the molecules to vibrate rapidly, generating thermal energy through a process called dielectric heating. This method is efficient because it heats the food quickly by targeting internal molecules rather than relying on external conduction.

40. (A) Statement I is true, Statement II is false
The scientific method is a rigorous process that relies on empirical evidence and measurable data to understand the natural world. Statement I accurately reflects this foundation. Statement II is false because a scientific theory is not an unverified assumption; it is a well-substantiated explanation of some aspect of the natural world based on a large body of evidence.

41. (B) Long-term health risks including damage to the cardiovascular system and liver
The use of performance-enhancing drugs in sports, known as doping, poses severe long-term health risks to athletes. These substances can cause significant damage to vital organs such as the heart and liver, lead to hormonal imbalances, and increase the risk of psychological issues. Far from providing benefits, doping undermines the physical and mental well-being of sports individuals.

42. (C) Development of nuclear warheads for strategic deterrence
Peaceful applications of nuclear science include generating carbon-free electricity, producing medical isotopes for diagnosing and treating diseases like cancer, and using scientific techniques in archaeology. The development of nuclear warheads is a military application intended for warfare or deterrence. Therefore, it does not fall under the category of peaceful use of nuclear technology, which focuses on societal benefits.

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43. (B) The alignment of planets determines individual human destiny and personality
This statement refers to astrology, which is a pseudoscience relying on the belief that celestial positions influence human affairs. It lacks empirical evidence and does not follow the scientific method. In contrast, the other options describe phenomena like eclipses, diseases, and earthquakes using established scientific principles based on observation, data, and testable explanations about the physical natural world.

44. (D) Quantitative observation - Recording the temperature as 45 degrees Celsius
A quantitative observation involves measurements and data expressed numerically, such as recording a temperature of 45 degrees Celsius. Qualitative observations, on the other hand, describe qualities or characteristics like color or texture without using numbers. Measuring weight or volume are quantitative tasks, while noting a color change is qualitative. Only the fourth pair correctly identifies the quantitative observation type.

45. (C) Alec Jeffreys
Sir Alec Jeffreys, a British geneticist, developed the techniques for DNA fingerprinting and DNA profiling. This breakthrough allowed for the identification of individuals based on unique patterns in their DNA, which has become a vital tool in forensic science for criminal investigations and paternity testing. His work has revolutionized the legal system and biological research worldwide since its inception.

46. (B) The use of biological systems and organisms to develop or make products
Biotechnology is a broad field that involves the use of living organisms, cells, or biological systems to create products or technologies intended to improve human life. This includes applications in agriculture, medicine, and industry, such as developing genetically modified crops, producing vaccines, and creating biofuels. It integrates biological sciences with technology to solve complex and pressing problems.

47. (A) Statement I is true, Statement II is false
Traditional knowledge systems like Ayurveda are based on centuries of empirical observation regarding the medicinal properties of plants. Modern pharmacology frequently investigates and utilizes these plant-based compounds to develop new drugs. Many modern medicines have their origins in traditional herbal remedies, making the claim that pharmacology completely ignores these historical discoveries and plant compounds entirely false.

48. (B) Hypothesis
A hypothesis is a proposed explanation for an observation or a specific phenomenon, serving as a starting point for further investigation. It is an educated guess that must be testable through experimentation or further observation. If a hypothesis is repeatedly supported by evidence, it may eventually contribute to the development of a broader and more comprehensive scientific theory.

49. (A) The heliocentric model proposed by Copernicus
The heliocentric model, which positions the Sun at the center of the solar system, was famously proposed by Nicolaus Copernicus during the Renaissance. While ancient Indian scientists like Aryabhata made significant contributions to mathematics and astronomy, including the value of pi and explanations for eclipses, the Copernican model is a product of early modern European scientific history.

50. (C) Economic growth, improved healthcare, and enhanced national security
The robust development of science and technology is a primary driver of a nation's progress. It leads to economic growth through innovation, improves public health through better medical treatments and diagnostics, and enhances national security through advanced defense systems. These advancements contribute to a higher standard of living and increased global competitiveness for the country in modern times.

51. (D) The study of human movement through biomechanics to improve athletic performance
Sports science is a multidisciplinary field that studies how the healthy human body works during exercise and how physical activity promotes health. It utilizes principles from biomechanics, physiology, and psychology to enhance athletic performance and prevent injuries. It is a rigorous scientific discipline that incorporates nutrition and medical knowledge to support athletes effectively across various sports disciplines.

52. (D) It builds a decentralized, evidence-informed, and bottom-up national STI ecosystem
India's Science, Technology and Innovation Policy 2020 aims to foster a more inclusive and decentralized scientific ecosystem. It emphasizes evidence-informed decision-making and a bottom-up approach to encourage research and innovation across the country. The policy seeks to increase private sector participation and international collaborations to make India a global leader in the fields of science and technology.

53. (A) Observation → Hypothesis → Experiment → Analysis → Conclusion
The scientific method typically begins with an observation that leads to a question. A researcher then forms a hypothesis as a tentative explanation. This hypothesis is tested through a controlled experiment. The resulting data is analyzed to see if it supports the hypothesis, ultimately leading to

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a conclusion. This systematic approach ensures objectivity and reproducibility in scientific research.

54. (C) Interdisciplinary
An interdisciplinary field involves the integration of perspectives and methods from multiple academic disciplines to address complex problems that cannot be solved by a single branch of knowledge. By crossing traditional boundaries, researchers can develop a more comprehensive understanding and reach innovative solutions. Examples include biochemistry and environmental science, which blend different scientific areas to achieve common research goals.

55. (A) Vigyan Prasar
Vigyan Prasar is an autonomous organization under the Department of Science and Technology, Government of India. Its primary mission is to promote scientific temper and popularize science among the general public through various media, including films, publications, and exhibitions. This helps in building a science-literate society and encourages rational thinking and inquiry among citizens of all ages.

56. (A) Psychiatry
Materials science is a field that studies the properties of solid materials and how they can be applied in engineering and technology. Metallurgy, ceramics, and polymer science are all sub-disciplines that focus on specific types of materials. Psychiatry is a branch of medicine focused on mental health and disorders, making it unrelated to the study of physical materials.

57. (A) 2, 4, 5, 1, 3
A forensic crime scene investigation begins with securing and isolating the scene to prevent contamination. Next, the scene is documented through photography. Physical evidence is then systematically collected and packaged for transport. Laboratory analysis is performed on this evidence to gain insights. Finally, the findings are presented in a court of law as part of the formal legal process.

58. (A) It relies on dogmatic acceptance of authority without questioning
The scientific method is fundamentally based on questioning and skepticism rather than the blind acceptance of authority. It requires systematic observation, experimentation, and data analysis to reach conclusions. Results must be reproducible by others to be accepted as valid. Scientific knowledge is always open to revision when new, more accurate evidence is gathered, ensuring constant progress and factual accuracy.

59. (D) I, II, and III
Ancient Indian science was highly advanced. Sushruta is recognized as the father of surgery for his pioneering work. Aryabhata provided scientific explanations for solar and lunar eclipses, moving away from mythological interpretations. Charaka authored the Charaka Samhita, a foundational text in Ayurveda. All these individuals contributed significantly to the fields of medicine, mathematics, and astronomy in classical antiquity.

60. (B) Control group
In a scientific experiment, the control group is the group that does not receive the experimental treatment and is used as a benchmark to measure how the other test subjects perform. In this case, the plants receiving only water provide a baseline to compare against the plants receiving the new fertilizer, allowing the researcher to isolate the fertilizer's effect.

61. (C) Jean-Baptiste Lamarck and Gottfried Reinhold Treviranus
The term "biology" was independently introduced in the early 19th century by Jean-Baptiste Lamarck and Gottfried Reinhold Treviranus. This new term reflected a shift toward viewing the study of living things as a unified science, rather than a collection of separate fields like botany and zoology. It laid the groundwork for the modern integrated study of life systems.

62. (A) Motherboard
In computer science, a motherboard is a physical hardware component that serves as the main circuit board of a computer. Operating systems, compilers, and application software are all types of software or logical constructs. Since the motherboard is the only tangible hardware item

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among the choices, it is the odd one out in the context of computer technology.

63. (A) Experimental Chemistry
Logic, theoretical computer science, and mathematics are all formal sciences that rely on deductive reasoning and abstract structures. They do not depend on empirical observation of the physical world. Experimental chemistry, however, is a natural science that uses empirical methods, observation, and experimentation to study matter and its changes, making it fundamentally different in its core research methodology.

64. (C) Set up an experiment with identical plants exposed to varying amounts of sunlight while keeping water and soil constant
To scientifically test a hypothesis, a controlled experiment must be conducted. This involves manipulating one variable, the amount of sunlight, while keeping all other factors like water and soil type constant. By using multiple identical plants, the researcher can ensure that any differences in growth are directly attributable to the change in sunlight, providing reliable data for thorough analysis.

65. (A) Archaea and Bacteria are classified under the exact same domain in modern taxonomy
In modern taxonomy, Archaea and Bacteria are classified into two distinct domains because they have fundamental differences in their genetic and biochemical makeup. While both are prokaryotes, they are as different from each other as they are from eukaryotes. The other statements correctly identify Carolus Linnaeus, binomial nomenclature, and the hierarchical relationship between genus and species in biology.

66. (A) NCSTC National Award for Science Popularization
The National Council for Science and Technology Communication National Award is presented annually in India to recognize outstanding efforts in science popularization. It honors individuals and organizations that have made significant contributions to communicating scientific knowledge and fostering a scientific temper among the masses. This award specifically targets the important area of science communication rather than research achievements.

67. (C) Applied medical science
Developing a vaccine involves using established scientific principles from virology and immunology to solve a specific, practical health problem. This makes it an achievement in applied medical science. Unlike pure theoretical physics, which explores fundamental laws, or astronomy, which studies celestial bodies, applied medical science focuses on creating tangible tools and treatments to improve human health outcomes directly.

68. (A) Both A and R are true and R is the correct explanation of A.
Biotechnology has significantly boosted agricultural productivity in the 21st century by providing innovative solutions for crop management. Genetic engineering allows scientists to create crop varieties with specific traits, such as resistance to pests and tolerance to herbicides. These advancements help reduce crop loss, lower the need for chemical pesticides, and ensure a more stable global food supply.

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69. (A) Replacing modern medicine with untested healing practices in national policy
Replacing evidence-based modern medicine with untested practices is a non-scientific approach that ignores the rigorous testing and validation required by the scientific method. In contrast, investing in space technology, nuclear power, and industrial research are all based on established scientific principles and have been central to India's policy of achieving self-reliance through legitimate and recognized science.

70. (C) Radio Telescope - Detecting radio frequency radiation emitted by extraterrestrial sources
A radio telescope is a specialized antenna and radio receiver used to detect radio waves from astronomical sources in the sky. This allows astronomers to study objects that do not emit much visible light. A spectroscope analyzes light, a barometer measures atmospheric pressure, and a seismograph records ground motion. Only the radio telescope is correctly matched with its primary function.

71. (A) The citizen's duty to develop scientific temper, humanism, and inquiry
Under Article 51A(h) of the Indian Constitution, it is a fundamental duty of every citizen to develop

scientific temper, humanism, and the spirit of inquiry and reform. This constitutional provision emphasizes the importance of rational thinking and scientific awareness in building a modern, progressive society. It encourages all citizens to base their beliefs and actions on reason and evidence.

72. (C) Both statements are true
Classical mechanics is highly accurate for describing the behavior of macroscopic objects at everyday speeds, as seen in the motion of cars or planets. However, it fails at the atomic scale, where quantum mechanics is necessary to explain the behavior of subatomic particles and energy. Both branches are essential parts of physics, each operating within its specific domain.

73. (D) The study of the distribution and determinants of health states in populations
Epidemiology is the cornerstone of public health and is defined as the study of how often diseases occur in different groups of people and why. It involves analyzing the distribution and causes of health-related states or events in specific populations. This information is crucial for controlling health problems and developing effective policies for disease prevention and health promotion.

74. (C) Antonie van Leeuwenhoek
Antonie van Leeuwenhoek is widely considered the father of microbiology for his pioneering work in observing and describing single-celled organisms. Using his own high-quality, handcrafted microscopes, he was the first to see bacteria and protozoa. His discoveries opened up a whole new world of microscopic life, laying the foundation for the field of microbiology and subsequent medical advances.

75. (D) S.N. Bose - Evolutionary Biology
Satyendra Nath Bose was an eminent physicist best known for his work in quantum mechanics, specifically the Bose-Einstein statistics and the theory of the Bose-Einstein condensate. The particle “boson” is named in his honor. He did not contribute to evolutionary biology. The other scientists listed are correctly matched with their respective fields of nuclear physics, space research, and agricultural science.

76. (D) Information acquired by observation or experimentation
Empirical evidence is the central requirement of the scientific method and refers to any information or data that is gathered through direct observation or controlled experimentation. It is evidence that can be verified and measured, providing a factual basis for scientific claims. This distinguishes science from other forms of knowledge that may rely on tradition, intuition, or pure abstract logic.

77. (D) A universal description of an observed phenomenon under specific conditions
A scientific law is a statement that describes an observable occurrence in nature that appears to always be true. It is a universal description based on repeated experimental observations but does not explain why the phenomenon occurs. Laws are often expressed mathematically and provide a reliable framework for making predictions about how the natural world will behave under specific conditions.

78. (D) Cosmology
Earth science, or geoscience, includes all fields of natural science related to the planet Earth. Geophysics, glaciology, and climatology are branches that study Earth’s physical properties, glaciers, and climate, respectively. Cosmology, however, is a branch of astronomy that deals with the origin and evolution of the entire universe, placing its scope far beyond the study of our planet.

79. (C) Both statements are true
Nanotechnology focuses on the study and manipulation of matter at the nanoscale, typically between 1 and 100 nanometers. At this extremely small scale, materials often exhibit unique and sometimes unexpected physical and chemical properties that differ from their behavior in bulk form. This phenomenon allows for the creation of new materials with enhanced strength, conductivity, or reactivity for technological use.

80. (D) The integration of ecology with human impact, policy, and other physical sciences
While ecology focuses specifically on the interactions between living organisms and their environment, environmental science is an interdisciplinary field with a broader scope. It

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integrates biological, physical, and information sciences to study the environment and find solutions to problems. It also encompasses the study of human impact on the planet, environmental policy, and various sustainable development strategies for the future.

81. (C) The eradication of superstitions and the fostering of rational thinking
Promoting a scientific temper in society is aimed at encouraging people to use logic, reason, and evidence in their daily lives. It seeks to replace blind faith and superstitions with a spirit of inquiry and a commitment to objective truth. This mindset is essential for social progress, as it empowers individuals to make informed decisions and approach challenges rationally.

82. (A) P-4, Q-1, R-3, S-2
Analytical chemistry focuses on the techniques used to identify and quantify matter. Biochemistry studies the chemical processes occurring within living organisms. Inorganic chemistry deals with compounds that lack carbon-hydrogen bonds, such as minerals and metals. Physical chemistry applies the principles of physics to understand the behavior and properties of chemical systems, bridging these two fundamental areas of scientific study.

83. (D) I, II, III and IV
Oceanography is a comprehensive science that covers a wide range of topics related to the world's oceans. This includes the study of physical phenomena like currents and waves, biological systems and marine life, the geology of the ocean floor and tectonic movements, and the chemical composition of seawater. All these areas are essential for a complete understanding of oceans.

84. (C) The discovery of the Raman Effect by Sir C.V. Raman
National Science Day is celebrated in India on February 28 to mark the discovery of the Raman Effect by the Indian physicist Sir C.V. Raman in 1928. This discovery, which earned him the Nobel Prize, was a landmark achievement for Indian science. The day is used to spread the message of the importance of science in daily life.

85. (C) Sehore
Rafi Ahmed Kidwai College of Agriculture is a prominent agricultural institution located in Sehore, Madhya Pradesh. It is one of the oldest agricultural colleges in the state and has contributed significantly to agricultural education and research. The college plays a vital role in developing new farming techniques and training professionals to enhance agricultural productivity and sustainability in the region.

86. (B) Pure/Basic science
Studying the mating rituals of deep-sea squid without any immediate goal of commercial application is a classic example of pure or basic science. This type of research is motivated by a desire to expand human knowledge and understand the natural world. While such studies may not have immediate practical uses, they provide the fundamental knowledge for future applied sciences.

87. (B) P-3, Q-4, R-2, S-1
Specialized branches of science focus on specific subjects. Mycology is the study of fungi. Oology is a branch of ornithology that deals with bird eggs. Virology is the scientific study of viruses and the diseases they cause. Entomology is the branch of zoology that focuses on the study of insects. Each field uses specific methodologies to understand its particular subject.

88. (B) The scientific study of the atmosphere that focuses on weather processes and forecasting
Meteorology is the scientific study of the earth's atmosphere, focusing on weather patterns and the processes that cause them. Meteorologists use data from various sources to provide forecasts and study long-term atmospheric changes. This field is essential for many sectors, including aviation, agriculture, and disaster management, as it helps people prepare for and mitigate the effects of weather-related events.

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89. (B) I, II, III and IV only
Peaceful nuclear technology has numerous applications. It provides a source of carbon-free electricity through nuclear power plants. In medicine, radioisotopes are used for diagnosing and treating diseases like cancer. In agriculture, radiation is used to develop improved crop varieties. Additionally, carbon dating is a vital

tool for determining the age of archaeological artifacts. Manufacturing missiles is a non-peaceful application.

90. (A) Metabolic disorders or diseases
In biochemistry, metabolic pathways are a series of chemical reactions that occur within a cell. If these pathways are disrupted due to genetic mutations that affect enzyme function, it leads to metabolic disorders. These conditions can cause the accumulation of toxic substances or the deficiency of essential molecules, resulting in various diseases that require specialized medical management and dietary interventions.

91. (B) Astrophysics
Astrophysics is the branch of physics that studies the physical and chemical properties of celestial objects and the universe as a whole. It uses the laws of physics to explain how stars are born, how they evolve, and how they eventually die. This field also investigates the behavior of galaxies and nebulae, providing a comprehensive understanding of the cosmos.

92. (D) Classical Thermodynamics
Biochemistry, geophysics, and astrobiology are all interdisciplinary fields that combine two or more distinct scientific branches to study complex phenomena. Classical thermodynamics, however, is a fundamental and traditional branch of physics that focuses on the relationships between heat, work, and energy in macroscopic systems. It does not inherently bridge two different scientific disciplines like the other provided options do.

93. (A) Telegraph → Telephone → Radio → Optical Fiber → Satellite Internet
The evolution of communication technology reflects the progress of science over time. The telegraph allowed long-distance communication, followed by the telephone for voice transmission. Radio technology later enabled wireless communication. The development of optical fibers revolutionized data transmission speeds. Finally, satellite internet has provided global connectivity, representing the latest stage in this technological progression driven by continuous scientific innovation.

94. (C) Subjectivity
The scientific method is characterized by objectivity, where results are based on facts and evidence rather than personal feelings or biases. It also relies on falsifiability, meaning a hypothesis can be proven wrong, and reproducibility, ensuring other researchers can achieve the same results. Subjectivity is the opposite of the scientific approach and is therefore not a property of science.

95. (A) Carbohydrates
In sports nutrition, carbohydrates are the primary macronutrient recommended for rapid glycogen replenishment after intense exercise. Glycogen is the stored form of glucose in muscles and the liver, and it is depleted during endurance activities. Consuming carbohydrates immediately after exercise helps the body quickly restore its energy reserves, facilitating faster recovery and preparation for subsequent physical activity periods.

96. (B) Medicine (Ayurveda)
The Charaka Samhita is one of the most important foundational texts of Ayurveda, the ancient Indian system of medicine. Authored by the sage Charaka, it provides detailed information on anatomy, physiology, and the treatment of various diseases using natural remedies. It remains a central reference for Ayurvedic practitioners today and is a testament to advanced scientific knowledge in ancient India.

97. (A) Anemometer - Measuring wind speed
An anemometer is a device used for measuring wind speed and direction, making it a crucial tool in meteorology. A hygrometer is used to measure humidity, while a lactometer measures the purity of milk. A seismograph records earthquake magnitude. Only the anemometer is correctly matched with its primary function of measuring wind speed among the measuring instruments listed in the options.

98. (A) 2, 1, 5, 4, 3
Biological organization follows a hierarchy of increasing complexity. It begins with the cell, the basic unit of life. Groups of similar cells form tissues. Different tissues working together create an organ. Multiple organs function together as an organ system. Finally, all the organ systems

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combine to form a complete organism. This ascending order reflects how living things are structured naturally.

99. (C) Both statements are true
Forensic entomology is the study of insects and other arthropods in a legal context, primarily to estimate the time of death in criminal investigations based on insect life cycles. This field relies heavily on established principles of zoology and ecology to understand species interactions. Both statements accurately describe the nature and methodology of this specialized and important scientific discipline.

100. (D) Solving practical problems to improve human life and technology
The ultimate goal of applied scientific research is to use existing scientific knowledge to develop practical solutions for real-world problems. Unlike pure research, which seeks to expand knowledge for its own sake, applied research is focused on creating tangible benefits. This includes developing new medical treatments, improving industrial processes, and creating technologies that enhance the quality of human life.

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CHAPTER 02

Indian Scientific Research Institutions and Madhya Pradesh–Based Institutions

1. The Biotechnology Industry Research Assistance Council (BIRAC) is a significant initiative in the Indian science ecosystem. What is its primary definition?
(A) A statutory body regulating the safety and usage of all genetically modified crops
(B) An international council for sharing biotechnology research data among SAARC nations
(C) A division of ICAR dedicated to developing pest-resistant agricultural seeds and grains
(D) A Section 8 public sector enterprise set up by DBT to empower biotech enterprises

2. The Indian Institute of Forest Management (IIFM), an autonomous institution under the Ministry of Environment, Forest and Climate Change, is located in which city of Madhya Pradesh?
(A) Jabalpur
(B) Gwalior
(C) Bhopal
(D) Indore

3. Read the following statements regarding the Defence Research and Development Organisation (DRDO):
Statement I: DRDO was formed by the amalgamation of the Technical Development Establishment and the Directorate of Technical Development and Production with the Defence Science Organisation.
Statement II: The Defence Research and Development Establishment (DRDE), a crucial laboratory of DRDO, is located in Bhopal, Madhya Pradesh.
Which of the following statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

4. Which of the following functions is not associated with the National Institute of Research in Tribal Problems based in Jabalpur?
(A) Conducting epidemiological studies on diseases prevalent among tribal populations
(B) Researching the nutritional status and health challenges of indigenous groups
(C) Implementing large-scale heavy industrial projects in tribal areas
(D) Providing policy inputs for the improvement of tribal health care systems

5. Read the following Assertion (A) and Reason (R) and select the correct answer from the options given below:
Assertion (A): The National Chemical Laboratory (NCL) plays a vital role in the growth of India's chemical and pharmaceutical industries.
Reason (R): NCL focuses exclusively on importing patented chemical technologies from foreign nations for use by Indian companies.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

6. Identify the odd one out among the following R&D focus areas with respect to the Central Drug Research Institute (CDRI), Lucknow:
(A) Development of new synthetic drugs
(B) Design and testing of heavy water reactors
(C) Evaluation of traditional Indian medicinal

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plants
(D) Repositioning of existing drugs for new therapeutic uses

7. Which of the following best defines the primary mandate of the Indian Space Research Organisation (ISRO) within the national science ecosystem?
(A) To secure India's borders using advanced missile defense and surveillance systems
(B) To develop space technology and its application to various national tasks
(C) To conduct fundamental research exclusively in theoretical astrophysics and cosmology
(D) To manage the nation's public sector telecommunications and satellite networks

8. Read the following statements regarding the Indian Institutes of Technology (IIT) system:
Statement I: The IITs are governed by the Institutes of Technology Act, 1961, which declares them as institutions of national importance.
Statement II: IIT Indore is the only IIT situated in the state of Madhya Pradesh.
Which of the following statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

9. Which of the following is a negative or incorrect statement regarding the Raja Ramanna Centre for Advanced Technology (RRCAT)?
(A) It is a unit of the Department of Atomic Energy
(B) It leads the development of India's indigenous satellite launch vehicle technologies
(C) It is located in Indore, Madhya Pradesh
(D) It focuses on research in lasers, particle accelerators, and related technologies

10. Which of the following is an accurate factual statement regarding the Bhabha Atomic Research Centre (BARC)?
(A) It functions under the administrative control of the Ministry of Power
(B) Its primary mandate is to manage India's commercial coal reserves
(C) It was originally established as the Atomic Energy Establishment, Trombay (AEET)
(D) It was founded jointly by Homi J. Bhabha and C.V. Raman

11. Read the following statements about the Forest Survey of India (FSI):
I. It is responsible for conducting the biennial assessment of forest cover in India.
II. FSI was established in 1981 as a successor to the Pre-investment Survey of Forest Resources.
III. According to FSI data, Madhya Pradesh has the largest forest cover in the country in terms of area.
IV. Its headquarters is situated in Jabalpur, Madhya Pradesh.
Which of the above statement(s) is/are correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

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12. Match List I with List II and select the correct answer using the codes given below:
List I: (Institutions)
P. Advanced Materials and Processes Research Institute
Q. Raja Ramanna Centre for Advanced Technology
R. Indira Gandhi National Tribal University
S. National Institute of Research in Tribal Problems
List II: (Locations in Madhya Pradesh)
1. Indore
2. Jabalpur
3. Amarkantak
4. Bhopal
(A) P-4, Q-1, R-3, S-2
(B) P-4, Q-3, R-1, S-2
(C) P-1, Q-4, R-3, S-2
(D) P-2, Q-1, R-3, S-4

13. Read the following statements regarding the Advanced Materials and Processes Research Institute (AMPRI):
I. It is located in Bhopal, Madhya Pradesh.
II. It functions under the aegis of the Indian Council of Agricultural Research (ICAR).
III. Its research focuses on developing lightweight materials, radiation shielding, and waste utilization.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

14. Which of the following pairs concerning the National Institute of Oceanography (NIO) is correctly matched?
(A) Parent Organization - Department of Earth Sciences
(B) Primary Mandate - Developing deep-sea naval weaponry
(C) Headquarters - Dona Paula, Goa
(D) Research Vessel Name - INS Vikrant

15. The Vikram Sarabhai Space Centre (VSSC) plays a pivotal role in the national space programme. Which concept best explains its strategic linkage to ISRO's broader mandate?
(A) It handles the global marketing and commercial satellite launch contracts for ISRO
(B) It is responsible for the deep space tracking network facilities located outside India
(C) It focuses entirely on analyzing scientific data received from various lunar rovers
(D) It serves as the lead centre for the development of satellite launch vehicles

16. The Council of Scientific and Industrial Research (CSIR) is a premier R&D organization in India. In which year was it established?
(A) 1935
(B) 1942
(C) 1947
(D) 1950

17. Arrange the following institutions situated in Madhya Pradesh in the chronological order of their establishment:
1. Rajiv Gandhi Proudyogiki Vishwavidyalaya (RGPV)
2. Advanced Materials and Processes Research Institute (AMPRI)
3. Indira Gandhi National Tribal University (IGNTU)
4. Indian Institute of Science Education and Research (IISER) Bhopal
Which of the following represents the correct chronological order?
(A) 2, 1, 3, 4
(B) 1, 2, 3, 4
(C) 2, 4, 1, 3
(D) 4, 2, 3, 1

18. How does the Indian Council of Agricultural Research (ICAR) directly support the agricultural ecosystem of Madhya Pradesh?
(A) By operating institutes like CIAE Bhopal to advance national farm mechanization
(B) By directly purchasing agricultural produce from local farmers at minimum support prices
(C) By regulating the state's agricultural export policies and implementing trade tariffs
(D) By providing direct financial subsidies and low-interest loans to farmers in the state

19. Which of the following is a correct statement regarding the Rajiv Gandhi Proudyogiki Vishwavidyalaya (RGPV)?
(A) It is a central university exclusively dedicated to promoting various tribal education initiatives
(B) It operates under the administrative control and funding of the Department of Atomic Energy
(C) It was established primarily to manage the governance of all state-run agricultural colleges
(D) It serves as the primary technical university of Madhya Pradesh, located in Bhopal

20. The Indian Institute of Science (IISc) Bangalore, renowned for its research contributions, was established in the year 1909. Who among the following was a key visionary behind its founding?
(A) Jamsetji Nusserwanji Tata
(B) Sir M. Visvesvaraya
(C) Homi J. Bhabha
(D) Shanti Swarup Bhatnagar

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21. Which of the following statements represents the best description of the National Environmental Engineering Research Institute (NEERI)?
(A) A statutory body that exclusively issues environmental clearances for various industrial projects
(B) An NGO focused on wildlife conservation advocacy throughout the regions of the Western Ghats
(C) A CSIR laboratory dedicated to research and innovations in environmental engineering
(D) A department under the Ministry of Earth Sciences studying various meteorological phenomena

22. Identify the odd one out among the following units operating under the Department of Atomic Energy (DAE):
(A) Bhabha Atomic Research Centre (BARC)
(B) National Physical Laboratory (NPL)
(C) Indira Gandhi Centre for Atomic Research (IGCAR)
(D) Variable Energy Cyclotron Centre (VECC)

23. What is the fundamental responsibility of the National Physical Laboratory (NPL) located in New Delhi?
(A) Developing advanced physical defense systems for specialized units of the Indian Navy
(B) Conducting physiological research on human endurance levels in extreme environments
(C) Surveying the physical geography and creating topological maps of the subcontinent
(D) Maintaining national measurement standards and providing calibration services

24. Identify the correct statement regarding the Indian Institute of Science Education and Research (IISER) Bhopal.
(A) It was established to provide undergraduate and postgraduate teaching in arts and humanities
(B) It was the first IISER to be established in India among all the current active campuses
(C) It is governed directly by the Madhya Pradesh Council of Science and Technology's board
(D) It focuses on integrating science education with cutting-edge basic research

25. What has been a direct effect of NITI Aayog's involvement in India's science and technology policy?
(A) The complete privatization of the Indian Space Research Organisation's assets
(B) The launch of the Atal Innovation Mission to promote innovation and entrepreneurship
(C) The dissolution of the Council of Scientific and Industrial Research's laboratories
(D) The shifting of all medical research responsibilities from ICMR to the state level

26. Which of the following statements regarding the Indian Council of Medical Research (ICMR) is incorrect?
(A) It is one of the oldest and largest medical research bodies in the world
(B) It functions under the Department of Health Research, Ministry of Health and Family Welfare
(C) The National Institute for Research in Environmental Health, an ICMR institute, is located in Bhopal
(D) Its primary focus is restricted to managing clinical trials for private pharmaceutical companies

27. What is the primary function of the Madhya Pradesh Council of Science and Technology (MPCST)?
(A) Promoting S&T applications for the socio-economic development of the state
(B) Formulating the national space policy for the central Government of India
(C) Regulating the pharmaceutical manufacturing industry across all of central India
(D) Managing the fiscal deficits of various technical universities in Madhya Pradesh

28. Which of the following is not a primary role of the Department of Science and Technology (DST) in India?
(A) Manufacturing heavy machinery for industrial applications
(B) Formulating science and technology policies
(C) Promoting new areas of science and technology
(D) Supporting fundamental research through autonomous institutions

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29. The Indira Gandhi National Tribal University (IGNTU) was established by an Act of Parliament. In which district of Madhya Pradesh is its main campus located?
(A) Mandla
(B) Jhabua
(C) Anuppur
(D) Alirajpur

30. Which statement represents the most appropriate description of the Indian Agricultural Research Institute (IARI)?
(A) It is a regulatory agency responsible for setting food safety standards in markets
(B) It is a commercial seed production company operating under a public-private model
(C) It focuses primarily on distributing agricultural loans to small and marginal farmers
(D) It is India's premier institute for agricultural research and the Green Revolution

31. Which of the following is an incorrect statement regarding R&D expenditure in India?
(A) The public sector accounts for the majority of the total R&D expenditure in India
(B) The private sector's contribution to R&D in India is lower compared to developed nations
(C) The GERD in India has consistently remained above 2% of GDP over the last decade
(D) The Department of Science and Technology is a major funding agency for public sector research

32. Identify the odd one out among the activities primarily associated with the National Physical Laboratory (NPL):
(A) Realization of Indian Standard Time (IST)
(B) Conducting marine archeological excavations
(C) Development of certified reference materials
(D) Calibration of precision measuring instruments

33. Who among the following scientists of Indian origin was awarded the Nobel Prize in Physics for his work on the scattering of light?
(A) Subrahmanyan Chandrasekhar
(B) C.V. Raman
(C) Har Gobind Khorana
(D) Venkatraman Ramakrishnan

34. Match List I with List II and select the correct answer using the codes given below:
List I: (Research Institutions)
P. National Physical Laboratory
Q. Central Drug Research Institute
R. Indian Agricultural Research Institute
S. Bhabha Atomic Research Centre
List II: (Parent Organization/Ministry)
1. ICAR
2. CSIR
3. DAE
4. DST
(A) P-2, Q-2, R-1, S-3
(B) P-4, Q-2, R-1, S-3
(C) P-2, Q-1, R-4, S-3
(D) P-4, Q-3, R-1, S-2

35. Which of the following represents the correct chronological order of the establishment of premier scientific institutions in India?
(A) Indian Institute of Science → Council of Scientific and Industrial Research → Indian Space Research Organisation → Department of Biotechnology
(B) Council of Scientific and Industrial Research → Indian Institute of Science → Indian Space Research Organisation → Department of Biotechnology
(C) Indian Institute of Science → Indian Space Research Organisation → Council of Scientific and Industrial Research → Department of Biotechnology
(D) Council of Scientific and Industrial Research → Indian Space Research Organisation → Indian Institute of Science → Department of Biotechnology

36. What was a primary institutional cause for the establishment of the Indian Institute of Forest Management (IIFM) in Bhopal?
(A) To address the need for managerial human resources in forestry and allied sectors
(B) To create a dedicated military training academy for all the various border security forces
(C) To manage the distribution of all chemical fertilizers throughout the central Indian states

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(D) To serve as an official appellate tribunal for various regional environmental law disputes

37. How does the Central Arid Zone Research Institute (CAZRI) research hold relevance for specific regions of Madhya Pradesh?
(A) By offering dryland farming and water conservation strategies for Bundelkhand
(B) By developing frost-resistant tea varieties specifically for the Malwa plateau region
(C) By designing deep-sea fishing techniques for use in the state's various reservoirs
(D) By promoting intensive paddy cultivation techniques throughout the Narmada valley

38. What has been a direct effect of the initiatives launched by the Department of Biotechnology (DBT) such as the National Biopharma Mission?
(A) Complete elimination of all synthetic pharmaceutical imports from foreign trade partners
(B) The transfer of biopharma patent rights to various international health organizations
(C) The prohibition of traditional Ayurvedic research throughout central government universities
(D) Acceleration of research and development for biopharmaceuticals and vaccines in India

39. The High Yielding Varieties (HYV) of seeds, particularly wheat, developed by the Indian Agricultural Research Institute (IARI) were fundamental to India's Green Revolution. Which concept accurately describes this technological intervention?
(A) Organic farming transition
(B) Genetic mutation through radiation
(C) Hydroponic cultivation scaling
(D) Crop improvement through cross-breeding and genetics

40. Which of the following is the most appropriate description of the "Triple Helix Model" often referenced in the context of the Indian science and technology ecosystem?
(A) The integration of ISRO, DRDO, and BARC under a single unified operational command structure
(B) The three-stage nuclear power programme originally developed by the scientist Homi Bhabha
(C) The administrative hierarchy of central, state, and local level science and research councils
(D) Collaborative interaction between academia, industry, and government for innovation

41. Identify the odd one out among the academic faculties typically found at the Indira Gandhi National Tribal University (IGNTU):
(A) Faculty of Tribal Studies
(B) Faculty of Naval Architecture and Marine Engineering
(C) Faculty of Earth Sciences
(D) Faculty of Social Sciences

42. What is the primary effect of the Indian Patents Act, 1970 (along with its subsequent amendments) on the scientific ecosystem?
(A) It permanently eliminated all forms of patent protection for pharmaceutical compounds and drugs
(B) It prohibits Indian researchers from filing for patents in any foreign or international jurisdictions
(C) It balances inventor intellectual property rights with public access to technology
(D) It transfers all intellectual property generated by private R&D directly to the central government

43. Read the following statements regarding the Bhabha Atomic Research Centre (BARC):
I. It is India's premier nuclear research facility headquartered in Trombay, Mumbai.
II. Apsara was the first nuclear research reactor in Asia, built at BARC.
III. BARC operates under the Department of Atomic Energy.
IV. It was originally established as the Atomic Energy Establishment, Trombay (AEET).
V. It plays a pivotal role in India's three-stage nuclear power programme.
Which of the above statement(s) is/are correct?
(A) I, II, III, IV and V
(B) I, II, IV and V only
(C) II, III, IV and V only
(D) I, III, IV and V only

44. Read the following statements regarding ICAR's presence in Madhya Pradesh:

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Statement I: The Indian Institute of Soybean Research, a premier ICAR institute, is located in Indore to support the state's large soybean cultivation.
Statement II: Madhya Pradesh is often referred to as the "Soy State" of India due to its significant contribution to national soybean production.
Which of the following statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

45. Which of the following is a correct statement regarding the research focus of AMPRI in Bhopal?
(A) It exclusively designs software for various large telecommunication network platforms
(B) It is responsible for mapping the genomic sequences of all endemic state flora species
(C) It researches advanced materials such as geopolymers and metal matrix composites
(D) It functions as the state's primary station for providing meteorological weather forecasts

46. Which of the following pairs correctly matches a prominent Indian scientist of Madhya Pradesh origin with their field of contribution?
(A) R.A. Mashelkar - Space Technology
(B) Anil Kakodkar - Nuclear Science and Engineering
(C) M.S. Swaminathan - Particle Physics
(D) Meghnad Saha - Plant Genetics

47. Which of the following statements about IIT Indore is incorrect?
(A) It was established by the Government of India in 2009
(B) It is the oldest technical institute in Madhya Pradesh
(C) It functions under the Institutes of Technology Act
(D) It has secured prominent rankings in the NIRF framework for engineering

48. The National Quantum Mission, recently approved by the Government of India, aims to achieve which of the following objectives?
(A) To eradicate vector-borne diseases using genetically modified mosquitoes and advanced tech
(B) To seed, nurture and scale up scientific and industrial R&D in quantum technology
(C) To map the entire genetic diversity and heritage of the Indian subcontinent's populations
(D) To establish permanent human colonies on the lunar surface by the end of the year 2030

49. Which of the following correctly pairs the National Chemical Laboratory (NCL) with its location?
(A) NCL - Pune
(B) NCL - Hyderabad
(C) NCL - Ahmedabad
(D) NCL - Lucknow

50. Which of the following facilities does NOT operate under the Department of Atomic Energy (DAE)?
(A) Heavy Water Board
(B) Nuclear Fuel Complex
(C) Bharat Heavy Electricals Limited
(D) Uranium Corporation of India Limited

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51. Which is the most appropriate description of the academic ecosystem fostered by Rajiv Gandhi Proudyogiki Vishwavidyalaya (RGPV)?
(A) It offers degrees solely in various disciplines of fine arts and traditional music styles
(B) It operates as an entirely privately funded deemed university for specialized research
(C) It focuses exclusively on primary and secondary school level teacher training programs
(D) It affiliates most engineering and pharmacy colleges across Madhya Pradesh

52. Match List I with List II and select the correct answer using the codes given below:
List I: (Pioneering Scientists of Indian Origin)
P. Anil Kakodkar
Q. Har Gobind Khorana
R. C.V. Raman
S. Vikram Sarabhai
List II: (Field/Achievement)

1. Deciphering the genetic code
2. Nuclear energy programme
3. Indian space programme
4. Scattering of light

(A) P-2, Q-4, R-1, S-3
(B) P-2, Q-1, R-4, S-3
(C) P-3, Q-1, R-4, S-2
(D) P-4, Q-2, R-1, S-3

53. Which of the following defense systems was NOT developed by the Defence Research and Development Organisation (DRDO)?
(A) Agni missile system
(B) Tejas Light Combat Aircraft
(C) S-400 Triumf air defense system
(D) Arjun Main Battle Tank

54. Who was the first Indian Director of the Indian Institute of Science (IISc), Bangalore?
(A) Homi J. Bhabha
(B) Satish Dhawan
(C) C.V. Raman
(D) J.C. Bose

55. Which of the following best describes the INSPIRE programme initiated by the Department of Science and Technology (DST)?
(A) A scheme to attract talent to science at an early age and build a human resource pool
(B) A financial package specifically designed for modernizing all current DRDO laboratories
(C) A satellite launch vehicle designed specifically for conducting remote sensing missions
(D) A policy framework for standardizing various industrial chemical processes in factories

56. Read the following statements regarding Science and Technology awards in India:
Statement I: The Shanti Swarup Bhatnagar Prize is awarded annually by the Department of Science and Technology.
Statement II: The Vigyan Ratna award has been instituted to recognize lifetime achievements and contributions in any field of science and technology.
Which of the following statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

57. Read the following statements regarding NITI Aayog's role in promoting scientific innovation:
Statement I: NITI Aayog publishes the India Innovation Index to rank states based on their innovation capabilities.
Statement II: Madhya Pradesh has consistently ranked as the number one state in the India Innovation Index since its inception.
Which of the following statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

58. NewSpace India Limited (NSIL), incorporated in 2019, functions under the administrative control of which entity?
(A) Department of Space
(B) Ministry of Commerce and Industry
(C) Ministry of Defence
(D) NITI Aayog

59. Which of the following is a factual statement about the research fleet managed by the National Institute of Oceanography (NIO)?
(A) The fleet consists entirely of various classes of nuclear-powered scientific submarines
(B) The vessels are strictly barred from conducting research in the Exclusive Economic Zone
(C) RV Sindhu Sankalp and RV Sindhu Sadhana are multidisciplinary research vessels of NIO
(D) The vessels were built and are operated jointly by ISRO and the American agency NASA

60. Among the various institutes operating under the Indian Council of Medical Research (ICMR),

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the National Institute of Virology is primarily famous for its crucial role in managing viral disease outbreaks. Where is it headquartered?
(A) New Delhi
(B) Pune
(C) Hyderabad
(D) Chennai

61. Read the following statements regarding the National Environmental Engineering Research Institute (NEERI):
Statement I: NEERI is headquartered in Nagpur and has a zonal laboratory in various cities to address regional environmental issues.
Statement II: It was established under the Department of Atomic Energy to monitor nuclear radiation exclusively.
Which of the following statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

62. The Defence Research and Development Establishment (DRDE) located in Gwalior, Madhya Pradesh, specializes primarily in:
(A) Research and development against chemical and biological warfare agents
(B) Designing submarine propulsion systems and underwater navigation technology
(C) Developing various radar-absorbing materials for the latest stealth aircraft
(D) Testing solid propellants used for high-range intercontinental ballistic missiles

63. Which organization established the National Institute of Research in Tribal Health (frequently associated with tribal problems research) in Jabalpur?
(A) Indian Council of Medical Research (ICMR)
(B) Indian Council of Agricultural Research (ICAR)
(C) Department of Space (DoS)
(D) Ministry of Tribal Affairs directly

64. The "Genome India Project" is a major initiative under which of the following departments?
(A) Department of Atomic Energy
(B) Department of Space
(C) Department of Biotechnology
(D) Department of Posts

65. National Science Day is celebrated in India on February 28th to commemorate which significant scientific event?
(A) The discovery of the Raman Effect by Sir C.V. Raman
(B) The successful launch of Aryabhata
(C) The successful nuclear test at Pokhran
(D) The founding of the Council of Scientific and Industrial Research

66. The application of radioisotopes in agriculture, extensively researched by BARC, involves the concept of:
(A) Developing mutant crop varieties with improved traits like higher yield
(B) Using radiation to generate large amounts of electricity for automated farm pumps
(C) Destroying all microbial life in farm soils to prevent the growth of common weeds
(D) Tracking the orbital movement of specialized agricultural satellites in space

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67. The Indus-1 and Indus-2 facilities located at the Raja Ramanna Centre for Advanced Technology (RRCAT) are examples of which type of scientific infrastructure?
(A) Fast breeder nuclear reactors
(B) Supercomputing clusters
(C) Synchrotron radiation sources
(D) Deep space tracking antennas

68. Which of the following is a correct statement regarding the National Green Hydrogen Mission?
(A) It strictly prohibits the involvement of private sector companies in hydrogen production
(B) It aims to make India a global hub for Green Hydrogen production and export
(C) It focuses exclusively on extracting hydrogen from fossil fuels like coal and gas
(D) It is administered primarily by the Ministry of Earth Sciences and meteorology

69. Which of the following is the most appropriate description of the Central Institute of Agricultural Engineering (CIAE) located in Madhya Pradesh?
(A) It is an ICAR institute engaged in agricultural mechanization R&D
(B) It is a deemed university under the Ministry of Education focusing on rural sociology
(C) It is a private testing facility for tractors imported from international manufacturers
(D) It is a regulatory body controlling prices of all agricultural implements in India

70. A direct cause-and-effect application of the data generated by the Forest Survey of India (FSI) for Madhya Pradesh is:
(A) Identifying potential locations for future offshore drilling and gas extraction
(B) Regulating the urban traffic flow and congestion in the cities of Bhopal and Indore
(C) Aiding state policies for afforestation and forest conservation measures
(D) Determining the exact population counts of various aquatic species in the Narmada

71. Read the following statements regarding the research mandate of the IITs:
Statement I: The IITs are increasingly focusing on interdisciplinary research areas such as artificial intelligence, nanotechnology, and renewable energy.
Statement II: IITs are legally prohibited from collaborating with private sector industries for commercial technology development.
Which of the following statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

72. Which of the following pairs is correctly matched regarding ISRO facilities?
(A) Satish Dhawan Space Centre (SDSC) - Bengaluru
(B) Vikram Sarabhai Space Centre (VSSC) - Thiruvananthapuram
(C) Space Applications Centre (SAC) - Hyderabad
(D) Liquid Propulsion Systems Centre (LPSC) - Ahmedabad

73. Read the following statements regarding ISRO's operational capabilities:
Statement I: The Gaganyaan mission is ISRO's project to demonstrate human spaceflight capability.
Statement II: The launch port for ISRO's orbital missions is located in Sriharikota.
Which of the following statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

74. Which of the following statements about the intellectual property rights (IPR) regime in India is incorrect?
(A) India is a signatory to the international TRIPS agreement
(B) The term of a patent in India is 20 years from the date of filing
(C) Computer programs are patentable per se, without any hardware applicability requirement
(D) The Controller General of Patents is the authority administering the Patents Act

75. Identify the odd one out among the autonomous bodies functioning under the Department of Science and Technology (DST):
(A) Aryabhatta Research Institute of Observational Sciences (ARIES)
(B) Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR)
(C) Raman Research Institute (RRI)
(D) Saha Institute of Nuclear Physics (SINP)

76. Read the following Assertion (A) and Reason (R) and select the correct answer from the options given below:
Assertion (A): The Indian Institute of Science Education and Research (IISER) Bhopal

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is recognized as an Institute of National Importance.
Reason (R): IISER Bhopal was established by the Ministry of Environment, Forest and Climate Change.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

77. Which of the following statements concerning the Department of Atomic Energy (DAE) is negative/incorrect?
(A) DAE is under the direct charge of the Prime Minister of India
(B) Nuclear Power Corporation of India Limited (NPCIL) operates under DAE
(C) DAE oversees fundamental research institutions like the TIFR
(D) DAE relies on enriched uranium imports for its entire three-stage nuclear programme

78. Read the following statements regarding the Wildlife Institute of India (WII) and its relevance to Madhya Pradesh:
I. WII is an autonomous institution under the Ministry of Environment, Forest and Climate Change.
II. It has been actively involved in the tiger reintroduction programme in the Panna Tiger Reserve.
III. The headquarters of the Wildlife Institute of India is located in Bhopal.
Which of the above statement(s) is/are incorrect?
(A) I only
(B) III only
(C) I and II only
(D) II and III only

79. What is the expected societal cause-and-effect outcome of the "CSIR-800" program launched by the Council of Scientific and Industrial Research?
(A) Expanding the number of CSIR labs to exactly 800 worldwide across all continents
(B) Improving the quality of life of 800 million Indians via S&T interventions
(C) Publishing 800 high-impact scientific papers annually in global peer-reviewed journals
(D) Securing 800 international patents in the biotechnology sector by the year 2030

80. Match List I with List II and select the correct answer using the codes given below:
List I: (Science and Technology Awards)
P. Shanti Swarup Bhatnagar Prize
Q. Vigyan Ratna
R. Homi Bhabha Award
S. Norman Borlaug Award
List II: (Recognized Field/Criterion)
1. Lifetime achievements and contributions in any field of science and technology
2. Outstanding research in applied agriculture and environment
3. Outstanding contributions in applied and fundamental sciences by young scientists
4. Exceptional contributions in the field of atomic energy
(A) P-3, Q-1, R-4, S-2
(B) P-1, Q-3, R-4, S-2
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-1, R-3, S-2

81. The Pusa Institute is a popular historical name for which of the following premier research organizations?
(A) Indian Institute of Science
(B) National Physical Laboratory
(C) Indian Agricultural Research Institute
(D) Bhabha Atomic Research Centre

82. The concept of "pharmacognosy" utilized at the Central Drug Research Institute (CDRI) broadly refers to:
(A) The study of medicines or crude drugs derived from natural sources
(B) The specialized study of synthetic polymer degradation and plastics
(C) The administrative process of patenting clinical trial research data
(D) The high-level engineering of specialized biomedical imaging devices

83. Dr. J.S. Rajput, an eminent academician and scientist born in Madhya Pradesh, made significant contributions to which area?
(A) Advanced quantum cryptography
(B) Design of cryogenic rocket engines
(C) Deciphering ancient metallurgical processes
(D) Educational research and science

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popularization

84. Which pair of ICMR institution and its primary focus area is correctly matched?
(A) National Institute of Malaria Research - Nutritional disorders
(B) National Institute of Nutrition - Vector-borne diseases
(C) National Institute of Virology - Viral infections and outbreaks
(D) National Institute of Occupational Health - Tuberculosis genetics

85. The concept of "frugal innovation" in the Indian S&T ecosystem is best exemplified by which of the following?
(A) Importing the most expensive supercomputers from foreign vendors for basic use
(B) Abandoning basic research to focus solely on luxury consumer goods for urbanites
(C) Developing high-quality, cost-effective technologies like the Mangalyaan mission
(D) Relying entirely on international grants to fund all domestic science research efforts

86. Which of the following initiatives is NOT generally undertaken by the Madhya Pradesh Council of Science and Technology (MPCST)?
(A) Organizing the MP Young Scientist Congress
(B) Formulating the monetary policy for the Reserve Bank of India
(C) Executing remote sensing and GIS applications for state planning
(D) Promoting science popularization at the grassroots level

87. Read the following statements regarding recent National Science and Technology Missions:
I. The National Quantum Mission aims to seed, nurture and scale up scientific and industrial R&D in quantum technology.
II. The Deep Ocean Mission is primarily implemented by the Ministry of Earth Sciences.
III. The National Mission on Interdisciplinary Cyber-Physical Systems is implemented by the Department of Biotechnology.
IV. The Gaganyaan mission aims to demonstrate human spaceflight capability.
Which of the above combination of statements is incorrect?
(A) I and II only
(B) III only
(C) II and IV only
(D) I, III and IV only

88. What is the most accurate description of the Central Arid Zone Research Institute (CAZRI)?
(A) A CSIR laboratory focusing on oceanography and marine life throughout the coasts
(B) An ICAR institute dedicated to mitigating arid and semi-arid agricultural effects
(C) A DRDO unit responsible for testing high-grade weaponry in desert environments
(D) An ISRO centre tracking satellite trajectories from locations near the western border

89. Arrange the following milestones of the Indian space programme in chronological order:
1. Launch of the first sounding rocket from Thumba
2. Formation of the Indian Space Research Organisation (ISRO)
3. Launch of India's first satellite Aryabhata
4. Successful insertion of Mangalyaan into Martian orbit
Which of the following represents the correct chronological order?
(A) 1, 2, 3, 4
(B) 2, 1, 3, 4
(C) 1, 3, 2, 4
(D) 2, 3, 1, 4

90. Identify the odd one out among the factors historically contributing to lower private sector R&D investment in India:
(A) Over-availability of venture capital for deep-tech hardware startups in early phases
(B) High cost and risk associated with long-term basic research
(C) Strong preference for importing readymade technologies
(D) Inadequate industry-academia collaborative frameworks

91. Which of the following is a negative statement concerning the eligibility for the Shanti Swarup Bhatnagar Prize?
(A) It is awarded to scientists who have made outstanding contributions in India
(B) Only researchers above the age of 60 are

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eligible for the award
(C) It is given for research in disciplines such as Biological, Chemical, and Physical Sciences
(D) Overseas Citizens of India (OCI) and Persons of Indian Origin (PIO) working in India are eligible

92. A major cause-and-effect relationship established by the Wildlife Institute of India's (WII) research in Madhya Pradesh is:
(A) The introduction of genetically modified crops leading to higher tiger populations
(B) The deforestation of national parks resulting in rapid industrialization of the state
(C) Using ecological studies to facilitate wildlife management programs like in Panna
(D) The elimination of indigenous flora to make way for commercial forestry plantations

93. Which of the following is a correct statement regarding the activities of the MP Council of Science and Technology (MPCST)?
(A) It serves as the primary appellate authority for environmental law disputes in the state
(B) It holds a monopoly on manufacturing all scientific instruments for schools in India
(C) It manages various international space tracking networks on behalf of ISRO
(D) It provides remote sensing inputs for state natural resource management

94. Read the following statements regarding the Indian science and technology ecosystem:
I. The National Research Foundation (NRF) aims to seed and promote R&D across academic institutions.
II. Private sector investment in R&D in India currently exceeds public sector investment.
III. The Department of Science and Technology (DST) was established in 1971.
IV. India is among the top five countries globally in terms of the number of scientific publications.
V. The Indian Patent Office is administered by the Ministry of Science and Technology.
Which of the above combination of statements is incorrect?
(A) I and III only
(B) II and V only
(C) III and IV only
(D) I, IV and V only

95. Dr. Anil Kakodkar, an eminent scientist born in Madhya Pradesh, served as the chairman of which important national commission?
(A) Atomic Energy Commission
(B) Space Commission
(C) University Grants Commission
(D) Planning Commission

96. Which of the following represents the correct hierarchical order of India's intellectual property and patent administration from the top level to the operational level?
(A) Ministry of Commerce and Industry → Department for Promotion of Industry and Internal Trade (DPIIT) → Controller General of Patents, Designs and Trade Marks → Patent Office
(B) Ministry of Science and Technology → Department of Scientific and Industrial Research → Controller General of Patents, Designs and Trade Marks → Patent Office
(C) Ministry of Commerce and Industry → Controller General of Patents, Designs and Trade Marks → Department for Promotion of Industry and Internal Trade (DPIIT) → Patent Office
(D) Ministry of Science and Technology → Controller General of Patents, Designs and Trade Marks → Department of Scientific and Industrial Research → Patent Office

97. In India, a patent granted for a scientific invention is generally valid for how many years from the date of filing the application?
(A) 10 years
(B) 15 years
(C) 20 years
(D) 25 years

98. Match List I with List II and select the correct answer using the codes given below:
List I: (CSIR Laboratories)
P. NEERI
Q. NIO
R. NCL
S. AMPRI
List II: (Prime Focus Area)
1. Oceanography and marine research
2. Environmental engineering and monitoring
3. Advanced materials and processes
4. Chemical sciences and engineering

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(A) P-2, Q-1, R-3, S-4
(B) P-1, Q-2, R-4, S-3
(C) P-2, Q-1, R-4, S-3
(D) P-4, Q-3, R-1, S-2

99. The Forest Survey of India (FSI) utilizes which primary technology to assess the forest cover of India, including Madhya Pradesh?
(A) Manual counting of trees by ground personnel
(B) Subterranean seismic tracking
(C) Aerial drone spraying of chemical markers
(D) Remote sensing using satellite imagery

100. The concept behind the Deep Ocean Mission implemented by the Government of India includes which of the following key objectives?
(A) Constructing artificial islands in the Arabian Sea for international tourism projects
(B) Laying high-speed internet fiber optic cables across the Indian Ocean's entire floor
(C) Establishing underwater military naval bases for the docking of nuclear submarines
(D) Developing a manned submersible for human exploration at 6,000 metres depth

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ANSWERS

1. (D) A Section 8 public sector enterprise set up by DBT to empower biotech enterprises
BIRAC is an industry-academia interface agency established by the Department of Biotechnology. It operates as a not-for-profit public sector enterprise. The organization aims to strengthen and empower the emerging biotech industry. It focuses on strategic research and innovation to address societal needs. This initiative supports startups and small enterprises through funding and mentorship.

2. (C) Bhopal
The Indian Institute of Forest Management is an autonomous institute located in Bhopal. It was established in 1982 by the Ministry of Environment, Forest and Climate Change. The institute provides training and research in forest management and environmental sectors. It serves as a premier institution for managerial human resources in forestry. Its architecture is notably inspired by Mandu.

3. (C) Statement I is correct but Statement II is incorrect
DRDO originated in 1958 through the merger of existing technical and scientific establishments. Statement I accurately reflects this historical amalgamation process. However, the second statement is incorrect because the Defence Research and Development Establishment is situated in Gwalior, not Bhopal. DRDE focuses on chemical and biological defense research. This laboratory is vital for national security.

4. (C) Implementing large-scale heavy industrial projects in tribal areas
The National Institute of Research in Tribal Health, formerly known as the Regional Medical Research Centre for Tribals, is based in Jabalpur. It focuses on health, nutrition, and epidemiological studies specific to indigenous populations. It provides scientific data for policy improvements in tribal healthcare systems. Managing industrial projects falls outside its research-oriented mandate.

5. (C) A is true but R is false.
The National Chemical Laboratory is a key CSIR laboratory located in Pune. It contributes significantly to the pharmaceutical and chemical sectors through research and development. The reason is false because the institute prioritizes indigenous innovation and basic research rather than exclusively importing foreign patents. It works on catalysis, polymer science, and organic chemistry to foster domestic growth.

6. (B) Design and testing of heavy water reactors
The Central Drug Research Institute in Lucknow focuses on medicinal research and drug discovery. Its activities include developing synthetic drugs and evaluating traditional medicinal plants. It also works on drug repositioning for new therapies. Designing and testing heavy water reactors is a task related to nuclear energy. Such activities are managed by the Department of Atomic Energy.

7. (B) To develop space technology and its application to various national tasks
The Indian Space Research Organisation is the primary agency responsible for the nation's space program. Its mandate involves developing satellites and launch vehicles for communication, remote sensing, and navigation. These technologies support various national tasks like disaster management and weather forecasting. ISRO's core purpose is socio-economic development through technology. It operates under the Department of Space.

8. (A) Both Statement I and Statement II are correct
The IIT system is governed by the Institutes of Technology Act of 1961. This legislation designates these institutions as entities of national importance. Statement II is also correct because IIT Indore is currently the only Indian Institute of Technology located in Madhya Pradesh. It was established in 2009. These institutes provide high-quality technical education and research facilities.

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9. (B) It leads the development of India's indigenous satellite launch vehicle technologies
The Raja Ramanna Centre for Advanced Technology is a premier unit of the Department of Atomic Energy. It is situated in Indore and specializes in lasers and particle accelerators. Development of satellite launch vehicles is the primary responsibility of ISRO, specifically the Vikram Sarabhai Space Centre. RRCAT contributes to nuclear research through synchrotron radiation sources.

10. (C) It was originally established as the Atomic Energy Establishment, Trombay (AEET)
The Bhabha Atomic Research Centre was founded by Homi J. Bhabha in 1954. It was initially named the Atomic Energy Establishment, Trombay, before being renamed in 1967. It operates under the administrative control of the Department of Atomic Energy, not the Ministry of Power. The institute is the backbone of India's nuclear research and technology.

11. (A) I, II and III only
The Forest Survey of India conducts biennial assessments of the country's forest cover. It was established in 1981 as the successor to the Pre-investment Survey of Forest Resources. Data confirms that Madhya Pradesh possesses the largest forest area in India. Statement IV is incorrect because the headquarters of the organization is located in Dehradun, not Jabalpur.

12. (A) P-4, Q-1, R-3, S-2
AMPRI is located in Bhopal and focuses on material science. RRCAT is a prominent research center situated in Indore. The Indira Gandhi National Tribal University is established in Amarkantak to promote tribal education. The Regional Medical Research Centre for Tribals, now NIRTH, is based in Jabalpur. These institutions represent the diverse scientific and educational landscape of Madhya Pradesh.

13. (C) I and III only
The Advanced Materials and Processes Research Institute is based in Bhopal. It functions under the Council of Scientific and Industrial Research, not ICAR. Its research mandate includes developing lightweight materials and finding innovative ways to utilize waste products. It also works on radiation shielding technologies. These efforts are crucial for industrial applications and regional technological growth.

14. (C) Headquarters - Dona Paula, Goa
The National Institute of Oceanography is a major laboratory under the Council of Scientific and Industrial Research. It is headquartered at Dona Paula in Goa. Its primary mandate involves multidisciplinary oceanographic research, not naval weaponry. The organization utilizes specialized research vessels like RV Sindhu Sadhana. It studies the biological, chemical, and physical aspects of the Indian Ocean.

15. (D) It serves as the lead centre for the development of satellite launch vehicles
The Vikram Sarabhai Space Centre is a major facility of the Indian Space Research Organisation. It is located in Thiruvananthapuram and focuses on rocket and launch vehicle technology. VSSC is responsible for the design and development of the PSLV and GSLV series. This strategic linkage is vital for India's independent access to space through indigenous platforms.

16. (B) 1942
The Council of Scientific and Industrial Research was established in September 1942 as an autonomous body. It has grown into one of the largest public-funded R&D organizations in the world. CSIR operates a network of laboratories across India covering various scientific disciplines. Its founding was a significant step toward industrial self-reliance during the pre-independence era.

17. (2, 1, 3, 4)
AMPRI was originally established as RRL in 1981. Rajiv Gandhi Proudyogiki Vishwavidyalaya was founded in 1998 to manage technical education. The Indira Gandhi National Tribal University was established in 2007 through an Act of Parliament. IISER Bhopal was subsequently established in 2008. This order reflects the historical expansion of research and higher education infrastructure in Madhya Pradesh.

18. (A) By operating institutes like CIAE Bhopal to advance national farm mechanization
The Indian Council of Agricultural Research supports Madhya Pradesh through its specialized research institutes. The Central Institute of

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Agricultural Engineering in Bhopal focuses on developing modern machinery for farmers. This research enhances farm mechanization and productivity within the state. ICAR does not directly handle crop procurement or financial subsidies. Its primary role is providing technological scientific inputs.

19. (D) It serves as the primary technical university of Madhya Pradesh, located in Bhopal
is the main technical university of Madhya Pradesh, headquartered in Bhopal. It affiliates engineering, pharmacy, and management colleges across the state. It is a state university, not central, and is unrelated to atomic energy or agricultural governance.

20. (A) Jamsetji Nusserwanji Tata
The Indian Institute of Science in Bangalore was founded in 1909. Jamsetji Nusserwanji Tata was the primary visionary who conceptualized the institution for advanced scientific research. He collaborated with the Government of India and the Maharaja of Mysore to establish it. IISc remains a premier destination for higher education and research, producing many of the nation's scientists.

21. (C) A CSIR laboratory dedicated to research and innovations in environmental engineering
The National Environmental Engineering Research Institute is a constituent laboratory of the CSIR. It is headquartered in Nagpur and focuses on environmental science and engineering. NEERI conducts research on air pollution, water treatment, and waste management. It is not a regulatory body for industrial clearances. Its work provides scientific solutions for environmental sustainability and public health.

22. (B) National Physical Laboratory (NPL)
BARC, IGCAR, and VECC are all specialized research units operating under the Department of Atomic Energy. These facilities focus on nuclear research, reactor technology, and particle physics. The National Physical Laboratory is a constituent laboratory of the Council of Scientific and Industrial Research. NPL is responsible for maintaining national measurement standards and does not belong to the DAE.

23. (D) Maintaining national measurement standards and providing calibration services
The National Physical Laboratory is the National Metrology Institute of India. Its primary responsibility is the maintenance of national standards for physical measurements like time, length, and mass. It provides calibration services to ensure the accuracy of instruments used in industry and research. NPL also realizes the Indian Standard Time. It does not conduct marine archaeology.

24. (D) It focuses on integrating science education with cutting-edge basic research
The Indian Institute of Science Education and Research Bhopal was established in 2008. Its core mandate is to integrate high-quality science education with advanced basic research. It offers five-year integrated programs to encourage students toward research careers. It is an Institute of National Importance governed by a central Act, ensuring standardized excellence across its various academic departments.

25. (B) The launch of the Atal Innovation Mission to promote innovation and entrepreneurship
NITI Aayog has played a transformative role in India's innovation landscape. The launch of the Atal Innovation Mission is a flagship initiative to foster a culture of entrepreneurship and scientific temper. It establishes Tinkering Labs in schools and incubation centers for startups. This policy shift focuses on creating a robust innovation ecosystem through various school and college programs.

26. (D) Its primary focus is restricted to managing clinical trials for private pharmaceutical companies
The Indian Council of Medical Research is the apex body for biomedical research in India. It operates under the Department of Health Research and manages a network of institutes like NIREH in Bhopal. While it oversees clinical trial standards, its mandate is broad. It focuses on communicable diseases, maternal health, and nutrition, rather than just private trials.

27. (A) Promoting S&T applications for the socio-economic development of the state
The Madhya Pradesh Council of Science and Technology was established to facilitate scientific

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applications for state development. Its primary function is to promote research and technology that benefits the socio-economic sectors of Madhya Pradesh. It organizes scientific events and supports remote sensing applications for state planning. MPCST does not formulate national space policies or regulate pharmaceutical manufacturing industries.

28. (A) Manufacturing heavy machinery for industrial applications
The Department of Science and Technology is responsible for formulating national policies and promoting new research areas. It provides funding and support for fundamental research through various autonomous institutions. However, DST is not an industrial manufacturing entity. Producing heavy machinery is the domain of industrial public sector undertakings. DST focus remains on the promotion and coordination of scientific activities.

29. (C) Anuppur
The Indira Gandhi National Tribal University was established by an Act of Parliament in 2007. Its main campus is located in Amarkantak, which falls within the Anuppur district of Madhya Pradesh. The university focuses on tribal education, research, and the preservation of tribal culture. It aims to provide higher education opportunities specifically tailored for marginalized tribal communities.

30. (D) It is India's premier institute for agricultural research and the Green Revolution
The Indian Agricultural Research Institute, often called the Pusa Institute, is the nation's leading agricultural research organization. It played a pivotal role in the Green Revolution by developing high-yielding crop varieties. IARI focuses on research, education, and extension services in various agricultural disciplines. The institute is instrumental in ensuring India's food security through its continuous scientific innovations.

31. (C) The GERD in India has consistently remained above 2% of GDP over the last decade
In India, the public sector contributes significantly to the total research and development expenditure. While the private sector's contribution is growing, it remains lower than in many developed nations. Statement C is incorrect because India's Gross Expenditure on R&D has historically hovered around 0.6% to 0.7% of GDP. It has not reached the 2% threshold recently.

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32. (B) Conducting marine archeological excavations
The National Physical Laboratory is dedicated to metrology and physical standards. Its primary activities include maintaining Indian Standard Time and developing certified reference materials. It also provides calibration for precision instruments to maintain industrial accuracy. Marine archaeological excavations are unrelated to NPL's mandate. Such tasks are carried out by the National Institute of Oceanography or the Archaeological Survey.

33. (B) C.V. Raman
Sir C.V. Raman was awarded the Nobel Prize in Physics in 1930 for his groundbreaking work on the scattering of light. This phenomenon, known as the Raman Effect, demonstrated that light changes frequency when passing through transparent material. He was the first Asian to receive a Nobel Prize in science. His discovery has vast applications in spectroscopy and analysis.

34. (A) P-2, Q-2, R-1, S-3
NPL and CDRI are both constituent laboratories of the Council of Scientific and Industrial Research. The Indian Agricultural Research Institute operates under the Indian Council of Agricultural Research. The Bhabha Atomic Research Centre is a premier unit of the Department of Atomic Energy. These mappings reflect the administrative structure of India's major scientific research organizations and their parents.

35. (A) Indian Institute of Science → Council of Scientific and Industrial Research → Indian Space Research Organisation → Department of Biotechnology
The Indian Institute of Science was founded in 1909. CSIR followed in 1942 as an autonomous research body. ISRO was established in its current form in 1969 to spearhead the national space program. The Department of Biotechnology was created much later, in 1986, to focus on life sciences. This sequence illustrates the evolution of the Indian scientific landscape.

36. (A) To address the need for managerial human resources in forestry and allied sectors
The Indian Institute of Forest Management was established in Bhopal to fill a critical gap in the forestry sector. It focuses on developing professional managers who can handle forest resources and environmental challenges. This institutional cause led to the creation of a premier management school dedicated specifically to forestry. It does not function as a military training academy.

37. (A) By offering dryland farming and water conservation strategies for Bundelkhand
The Central Arid Zone Research Institute is primarily based in Jodhpur, but its research is relevant to arid regions of Madhya Pradesh. Areas like Bundelkhand face frequent drought and water scarcity. CAZRI provides scientific strategies for dryland farming and efficient water management. These interventions help local farmers adapt to harsh climatic conditions through sustainable agricultural and conservation practices.

38. (D) Acceleration of research and development for biopharmaceuticals and vaccines in India
The National Biopharma Mission is a significant initiative of the Department of Biotechnology. It aims to accelerate the development of indigenous biopharmaceuticals, including vaccines and medical devices. This program strengthens the research ecosystem and enhances industry-academia collaboration. The primary effect is the enhancement of national capabilities in life sciences and healthcare innovation, making India more self-reliant in medicine.

39. (D) Crop improvement through cross-breeding and genetics
The development of high-yielding varieties of wheat and other crops at IARI was based on scientific principles of genetics. Researchers used cross-breeding techniques to combine desirable traits like disease resistance and high productivity. This technological intervention was the cornerstone of the Green Revolution in India. It transformed the country from a food-deficient nation to a self-sufficient agricultural producer.

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40. (D) Collaborative interaction between academia, industry, and government for innovation
The Triple Helix Model describes a framework where academia, industry, and the government collaborate to drive innovation. In the Indian context, this involves universities conducting research, industries commercializing technologies, and government providing policy and funding support. This interaction is essential for a thriving scientific and technological ecosystem. It is a fundamental concept used to analyze modern innovation policies.

41. (B) Faculty of Naval Architecture and Marine Engineering
The Indira Gandhi National Tribal University focuses on subjects relevant to tribal life, social sciences, and earth sciences. It has faculties dedicated to tribal studies, humanities, and environmental research. Naval architecture and marine engineering are specialized fields related to maritime studies. Since the university is located in the landlocked region of Amarkantak, such a faculty is absent.

42. (C) It balances inventor intellectual property rights with public access to technology
The Indian Patents Act of 1970 was designed to protect the rights of inventors while ensuring that essential technologies remain accessible to the public. It includes provisions for compulsory licensing to prevent monopolies in sectors like healthcare. This balance is crucial for encouraging innovation without compromising public welfare. The Act provides a legal framework for managing intellectual property rights.

43. (A) I, II, III, IV and V
All provided statements about the Bhabha Atomic Research Centre are accurate. It is the premier nuclear facility located in Trombay and operates under the DAE. It was originally established as AEET and houses Asia's first research reactor, Apsara. BARC is the central pillar of India's three-stage nuclear power program. It continues to conduct diverse research in nuclear science.

44. (A) Both Statement I and Statement II are correct
The Indian Institute of Soybean Research is a leading ICAR facility located in Indore. It supports the extensive soybean cultivation found in Madhya Pradesh. The state is widely known

as the "Soy State" because it produces a major portion of India's total soybean output. Both statements correctly link the institute's location to the regional agricultural importance of soybean.

45. (C) It researches advanced materials such as geopolymers and metal matrix composites
The Advanced Materials and Processes Research Institute in Bhopal specializes in material science and engineering. Its research portfolio includes advanced geopolymers, metal matrix composites, and lightweight materials for industrial use. The institute also focuses on utilizing industrial waste for sustainable construction. It does not design telecommunication software. Its primary mission is developing innovative materials and processes for the manufacturing sector.

46. (B) Anil Kakodkar - Nuclear Science and Engineering
Anil Kakodkar is a renowned nuclear scientist born in Barwani, Madhya Pradesh. He served as the Chairman of the Atomic Energy Commission and made significant contributions to India's nuclear power program. Other listed scientists like M.S. Swaminathan are not of Madhya Pradesh origin. Kakodkar's leadership was pivotal in international nuclear negotiations and domestic technology development for peaceful nuclear uses.

47. (B) It is the oldest technical institute in Madhya Pradesh
IIT Indore was established in 2009 by the Government of India. While it is a premier institution, it is not the oldest technical institute in Madhya Pradesh. Other colleges, such as SGSITS in Indore or Jabalpur Engineering College, were established decades earlier. IIT Indore functions under the Institutes of Technology Act and has achieved high national rankings for its research.

48. (B) To seed, nurture and scale up scientific and industrial R&D in quantum technology
The National Quantum Mission was approved to position India as a leader in quantum research. Its primary objective is to develop and scale up technologies related to quantum computing, communication, and sensing. This mission involves collaboration between academic institutions and industries to create a robust R&D ecosystem. It does not focus on mosquito eradication or establishing human lunar colonies.

49. (A) NCL - Pune
The National Chemical Laboratory is a premier constituent laboratory of the CSIR. It is located in Pune, Maharashtra. NCL is known for its research in chemical sciences, catalysis, and polymer engineering. It plays a significant role in supporting the pharmaceutical and chemical industries in India. The institution has a long history of excellence in both basic and applied chemical research.

50. (C) Bharat Heavy Electricals Limited
The Heavy Water Board, Nuclear Fuel Complex, and Uranium Corporation of India are all integral units of the Department of Atomic Energy. They manage the production of materials required for nuclear power generation. Bharat Heavy Electricals Limited is a public sector undertaking under the Ministry of Heavy Industries. While BHEL manufactures equipment for power plants, it is not under the DAE.

51. (D) It affiliates most engineering and pharmacy colleges across Madhya Pradesh
Rajiv Gandhi Proudyogiki Vishwavidyalaya is the state technical university of Madhya Pradesh. Its primary role is to provide affiliation and academic governance to a large number of engineering, pharmacy, and management institutions in the state. It standardizes curricula and conducts examinations for various technical courses. The university is a state government entity, serving as a hub for professional education.

52. (B) P-2, Q-1, R-4, S-3
Anil Kakodkar is associated with the nuclear energy program. Har Gobind Khorana was awarded the Nobel Prize for deciphering the genetic code. C.V. Raman is famous for his discovery regarding the scattering of light. Vikram Sarabhai is considered the father of the Indian space program. This mapping highlights the major contributions of these eminent scientists to their respective fields.

53. (C) S-400 Triumf air defense system
The Agni missile, Tejas Light Combat Aircraft, and Arjun Main Battle Tank are all indigenous defense systems developed by DRDO. These

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projects showcase India's progress in military technology and self-reliance. The S-400 Triumf is a long-range surface-to-air missile system developed by Russia. India procured this system through an international agreement. It was not designed by the DRDO internally.

54. (C) C.V. Raman
Sir C.V. Raman became the first Indian Director of the Indian Institute of Science in 1933. Prior to his tenure, the institute was headed by British scientists. During his leadership, he established several new departments and promoted high-quality research in physics and chemistry. His appointment was a landmark event for Indian academia and the institutional development of science in India.

55. (A) A scheme to attract talent to science at an early age and build a human resource pool
Innovation in Science Pursuit for Inspired Research is a flagship scheme of the Department of Science and Technology. It aims to attract young talent to study science and pursue research careers. The program provides scholarships and fellowships at various levels, from school students to doctoral researchers. It is designed to build a strong human resource base for science.

56. (D) Statement I is incorrect but Statement II is correct
The Shanti Swarup Bhatnagar Prize is awarded annually by the Council of Scientific and Industrial Research, not the DST. Therefore, Statement I is incorrect. Statement II is correct because the Vigyan Ratna is a recently instituted award to recognize lifetime achievements in science and technology. This system of Rashtriya Vigyan Puraskar honors excellence across several prestigious scientific categories.

57. (C) Statement I is correct but Statement II is incorrect
NITI Aayog publishes the India Innovation Index to rank states based on their innovation environment and performance. Statement I accurately describes this policy tool. However, Statement II is incorrect because Madhya Pradesh has not consistently held the top rank. States like Karnataka have traditionally dominated the index. The index helps identify regional strengths and areas requiring future policy intervention.

58. (A) Department of Space
NewSpace India Limited is a central public sector enterprise established in 2019. It functions under the administrative control of the Department of Space. NSIL is the commercial arm of ISRO, responsible for enabling private sector participation in space activities. Its mandate includes production of launch vehicles and marketing services. It operates independently from the Ministry of Commerce or Defence.

59. (C) RV Sindhu Sankalp and RV Sindhu Sadhana are multidisciplinary research vessels of NIO
The National Institute of Oceanography manages a specialized fleet for marine research. RV Sindhu Sankalp and RV Sindhu Sadhana are advanced multidisciplinary vessels used for data collection in the Indian Ocean. These ships are equipped with modern scientific instruments for biological and geological studies. They are not nuclear submarines. The fleet enables scientists to explore the Exclusive Economic Zone.

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60. (B) Pune
The National Institute of Virology is a premier research institute under the Indian Council of Medical Research. It is headquartered in Pune, Maharashtra. NIV is at the forefront of researching viral diseases and managing outbreaks like COVID-19 and Nipah. It serves as a National Centre for the World Health Organization. The institute focuses on diagnosis, epidemiology, and vaccine development.

61. (C) Statement I is correct but Statement II is incorrect
The National Environmental Engineering Research Institute is headquartered in Nagpur and has several zonal laboratories. Statement I is correct. However, Statement II is incorrect because NEERI is a constituent laboratory of the CSIR, not the Department of Atomic Energy. Its focus is on general environmental engineering and pollution control. It provides technological solutions for sustainable development across the country.

62. (A) Research and development against chemical and biological warfare agents
The Defence Research and Development Establishment in Gwalior is a specialized laboratory of the DRDO. Its primary mandate

is research and development related to defense against chemical and biological warfare agents. It develops detection systems, protective equipment, and medical countermeasures. This work is vital for national security. DRDE also plays a role in environmental toxicology and identifying hazardous chemical substances.

63. (A) Indian Council of Medical Research (ICMR)
The National Institute of Research in Tribal Health is located in Jabalpur. It was established by the Indian Council of Medical Research to address the unique health challenges faced by tribal populations. The institute conducts research on diseases like malaria and tuberculosis prevalent in these communities. Its work provides the scientific basis for public health interventions in various tribal areas.

64. (C) Department of Biotechnology
The Genome India Project is a major national initiative led by the Department of Biotechnology. It aims to sequence the whole genomes of diverse Indian populations to create a reference database. This research helps in understanding the genetic basis of diseases and developing personalized medicine. The project involves a consortium of several premier academic and research institutions across the country.

65. (A) The discovery of the Raman Effect by Sir C.V. Raman
National Science Day is celebrated in India on February 28th every year. This date commemorates the announcement of the discovery of the Raman Effect by Sir C.V. Raman in 1928. His work on light scattering earned him the Nobel Prize in Physics. The day is dedicated to spreading the message of the importance of science and its practical application.

66. (A) Developing mutant crop varieties with improved traits like higher yield
BARC conducts extensive research on the application of nuclear technology in agriculture. Using radiation-induced mutation breeding, scientists develop new crop varieties with better yield and disease resistance. Radioisotopes are also used as tracers to study nutrient uptake and soil fertility. These techniques have led to the release of many successful varieties of oilseeds and pulses for Indian farmers.

67. (C) Synchrotron radiation sources
The Indus-1 and Indus-2 facilities at RRCAT Indore are synchrotron radiation sources. These are large particle accelerators that produce high-intensity radiation for research in physics, chemistry, and biology. Scientists use these facilities to study the atomic and molecular structure of materials. They are unique national assets that support advanced research across various scientific disciplines. They represent high-end scientific infrastructure.

68. (B) It aims to make India a global hub for Green Hydrogen production and export
The National Green Hydrogen Mission is a strategic initiative to promote clean energy. Its primary objective is to make India a global leader in the production and export of Green Hydrogen. The mission encourages using renewable energy for hydrogen production to reduce carbon emissions. It involves both public and private sector participation. This effort is crucial for achieving net-zero targets.

69. (A) It is an ICAR institute engaged in agricultural mechanization R&D
The Central Institute of Agricultural Engineering is a leading research institute located in Bhopal. It functions under the Indian Council of Agricultural Research. CIAE focuses on research and development in farm mechanization, post-harvest technology, and renewable energy for agriculture. The institute develops tools and machinery to increase farm productivity. It is a vital institution for advancing modern agricultural practices.

70. (C) Aiding state policies for afforestation and forest conservation measures
The data generated by the Forest Survey of India provides detailed information on forest cover and quality. For Madhya Pradesh, this information is used by the state government to plan afforestation drives and conservation efforts. It helps in identifying areas that need protection or restoration. FSI reports serve as a scientific basis for environmental policy and reporting at various levels.

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71. (C) Statement I is correct but Statement II is incorrect
The Indian Institutes of Technology have evolved into major research hubs. They focus on interdisciplinary areas like AI, nanotechnology, and clean energy. Statement I correctly identifies this trend. Statement II is incorrect because IITs are encouraged to collaborate with private industries through technology transfers and sponsored research. These partnerships are essential for commercializing academic innovations and bridging the gap.

72. (B) Vikram Sarabhai Space Centre (VSSC) - Thiruvananthapuram
The Vikram Sarabhai Space Centre is correctly matched with its location in Thiruvananthapuram. It is the lead center for launch vehicle development. The Satish Dhawan Space Centre is located in Sriharikota, not Bengaluru. The Space Applications Centre is in Ahmedabad, while the Liquid Propulsion Systems Centre has units in Valiamala. These centers have specific roles in ISRO's integrated space program.

73. (A) Both Statement I and Statement II are correct
The Gaganyaan mission is ISRO's high-profile project to demonstrate human spaceflight capability by sending astronauts into orbit. Statement I is correct. Statement II is also correct because the Satish Dhawan Space Centre in Sriharikota serves as India's primary spaceport for all orbital launches. Both missions and infrastructure are critical components of the national space agenda, showcasing indigenous technological growth.

74. (C) Computer programs are patentable per se, without any hardware applicability requirement
India is a signatory to the TRIPS agreement, and the patent term is 20 years. The Controller General of Patents administers the Act. Statement C is incorrect because, under the Indian Patents Act, computer programs are not patentable "per se." They must generally have a technical application or be part of an invention involving hardware to be eligible for protection.

75. (D) Saha Institute of Nuclear Physics (SINP)
ARIES, JNCASR, and the Raman Research Institute are all autonomous research institutions functioning under the Department of Science and Technology. They focus on observational sciences, material science, and physics. The Saha Institute of Nuclear Physics is an autonomous institution that operates under the administrative control of the Department of Atomic Energy. SINP's focus on nuclear research aligns it with DAE.

76. (C) A is true but R is false.
IISER Bhopal is indeed recognized as an Institute of National Importance under a central Act. However, the reason is false because IISERs are established by the Ministry of Education, not the Ministry of Environment, Forest and Climate Change. These institutes focus on basic science education and research. While they contribute to environmental studies, their administrative origins lie in education.

77. (D) DAE relies on enriched uranium imports for its entire three-stage nuclear programme
The Department of Atomic Energy is directly under the Prime Minister and oversees units like NPCIL and research bodies like TIFR. Statement D is incorrect because India's three-stage nuclear program is specifically designed to utilize domestic thorium reserves. While some reactors use imported uranium under safeguards, the long-term goal is energy independence through thorium. Enriched uranium is not the entire base.

78. (B) III only
The Wildlife Institute of India is an autonomous institution under the MOEFCC. It has been instrumental in wildlife management programs, including the tiger reintroduction in Panna. Statement III is incorrect because the headquarters of WII is located in Dehradun, Uttarakhand, not Bhopal. While it works extensively in Madhya Pradesh, its administrative base is in the north. The other statements are correct.

79. (B) Improving the quality of life of 800 million Indians via S&T interventions
The CSIR-800 program was launched with the goal of bringing scientific and technological solutions to the people at the base of the economic pyramid. It aims to improve the quality of life for 800 million Indians through affordable and sustainable interventions. This includes developments in water purification, housing,

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and agriculture. The program emphasizes "frugal innovation" to address societal challenges.

80. (A) P-3, Q-1, R-4, S-2
The Shanti Swarup Bhatnagar Prize is awarded for outstanding research by young scientists. Vigyan Ratna recognizes lifetime achievements across science and technology fields. The Homi Bhabha Award is given for contributions to atomic energy research. The Norman Borlaug Award honors excellence in agricultural and environmental research. This matching correctly identifies the specific purpose of each prestigious award in the ecosystem.

81. (C) Indian Agricultural Research Institute
The Indian Agricultural Research Institute is popularly known as the Pusa Institute. This name originates from its original location in Pusa, Bihar, where it was founded in 1905. Following a major earthquake, the institute was relocated to New Delhi in 1936. It remains a center of excellence for agricultural research and education. The name "Pusa" is still widely used.

82. (A) The study of medicines or crude drugs derived from natural sources
Pharmacognosy is a branch of science that focuses on medicinal drugs obtained from plants, microbes, and other natural sources. At the Central Drug Research Institute, this field involves identifying and evaluating bioactive compounds from traditional Indian medicinal plants. This research aims to discover new therapeutic agents. It is a vital part of drug discovery that bridges traditional knowledge with modern pharmacology.

83. (D) Educational research and science popularization
Dr. J.S. Rajput is an eminent scientist and academician from Madhya Pradesh. He has made significant contributions to the field of educational research and the popularization of science. He served as the Director of the NCERT and has been recognized for his work in school education and teacher training. His efforts have focused on improving the quality of science education.

84. (C) National Institute of Virology - Viral infections and outbreaks
The National Institute of Virology is specialized in the study of viruses and managing infectious disease outbreaks. This is its primary mandate under the ICMR. Other institutions like the National Institute of Nutrition focus on nutritional health. Occupational health is the focus of the NIOH. Only the match for the National Institute of Virology correctly represents its specialized area of research.

85. (C) Developing high-quality, cost-effective technologies like the Mangalyaan mission
Frugal innovation refers to the process of reducing the complexity and cost of a product while maintaining high quality. In the Indian science ecosystem, the Mangalyaan mission is a prime example. It reached Mars at a fraction of the cost of similar international missions. This approach emphasizes efficiency and resourcefulness in R&D, allowing India to achieve significant milestones with limited budgets.

86. (B) Formulating the monetary policy for the Reserve Bank of India
The MPCST is involved in organizing scientific congresses, promoting science popularization, and using remote sensing for state planning. These activities align with its mandate to promote science in Madhya Pradesh. Formulating monetary policy is the exclusive responsibility of the Reserve Bank of India. This task involves managing interest rates and money supply, which is entirely unrelated to scientific research.

87. (B) III only
The National Quantum Mission and Deep Ocean Mission are correctly described. The Gaganyaan mission indeed aims for human spaceflight. Statement III is incorrect because the National Mission on Interdisciplinary Cyber-Physical Systems is implemented by the Department of Science and Technology, not the Department of Biotechnology. This mission focuses on AI and robotics. The other statements accurately reflect the implementing agencies involved.

88. (B) An ICAR institute dedicated to mitigating arid and semi-arid agricultural effects
The Central Arid Zone Research Institute is a premier institute under the Indian Council of

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Agricultural Research. Its main goal is to conduct research on sustainable agriculture and resource management in arid and semi-arid regions. CAZRI works on sand dune stabilization and improving crop resilience in desert environments. It is not a CSIR lab, DRDO unit, or ISRO center.

89. (A) 1, 2, 3, 4
The first sounding rocket was launched from Thumba in 1963, marking the start of the Indian space program. ISRO was officially formed in 1969. The first Indian satellite, Aryabhata, was launched in 1975. The Mangalyaan mission successfully reached Mars in 2014. This sequence represents the key historical milestones in the evolution of India's space capabilities over several decades.

90. (A) Over-availability of venture capital for deep-tech hardware startups in early phases
Factors like high risk, the cost of basic research, and a preference for importing technology have historically hindered private R&D in India. Inadequate collaboration between industry and academia also plays a role. Option A is the odd one out because there is actually a shortage of venture capital for deep-tech hardware startups. This lack of funding is a major barrier.

91. (B) Only researchers above the age of 60 are eligible for the award
The Shanti Swarup Bhatnagar Prize is the most prestigious award for young scientists in India. It is given for outstanding research in several disciplines like biological and physical sciences. OCI researchers working in India are eligible. Statement B is incorrect because the award is specifically intended for researchers under the age of 45. It recognizes excellence during early career stages.

92. (C) Using ecological studies to facilitate wildlife management programs like in Panna
The Wildlife Institute of India conducts detailed ecological research on various species and habitats. In Madhya Pradesh, this research has been applied to successful conservation programs. A notable example is the tiger reintroduction project in Panna Tiger Reserve, which relied on WII's scientific expertise. These studies help managers make informed decisions about habitat restoration and species protection in the state.

93. (D) It provides remote sensing inputs for state natural resource management
The Madhya Pradesh Council of Science and Technology uses advanced technologies like remote sensing and GIS to support the state. This includes mapping land use and water resources for better management. These inputs are used by various state departments for developmental planning. MPCST does not hold a monopoly on instrument manufacturing or act as a judicial authority for environmental law.

94. (B) II and V only
The NRF and DST were established to promote research, and India ranks high in scientific publications. Statement II is incorrect because public sector investment in R&D still exceeds private sector investment. Statement V is also incorrect because the Indian Patent Office is administered by the Ministry of Commerce and Industry, not the Ministry of Science and Technology. These are key distinctions.

95. (A) Atomic Energy Commission
Dr. Anil Kakodkar is a distinguished nuclear scientist who served as the Chairman of the Atomic Energy Commission of India. In this role, he also functioned as the Secretary to the Department of Atomic Energy. He was a key figure in the development of the Advanced Heavy Water Reactor. His leadership was crucial during the negotiation of the civil nuclear deal.

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96. (A) Ministry of Commerce and Industry → Department for Promotion of Industry and Internal Trade (DPIIT) → Controller General of Patents, Designs and Trade Marks → Patent Office
The administration of intellectual property in India follows a clear hierarchical structure under the Ministry of Commerce and Industry. The Department for Promotion of Industry and Internal Trade oversees the policy aspects. The Controller General of Patents, Designs and Trade Marks is the official authority. The Patent Office itself handles the examination and grant of patents through its various branches.

97. (C) 20 years
In India, according to the Patents Act of 1970 and its amendments, a patent is granted for a period of 20 years. This term begins from the date of

filing the application. This duration is consistent with international standards set by the TRIPS agreement. During this period, the patent holder has exclusive rights. After expiry, the technology enters the public domain.

98. (C) P-2, Q-1, R-4, S-3
NEERI focuses on environmental engineering and monitoring. NIO is dedicated to oceanography and marine research. NCL specializes in chemical sciences and engineering. AMPRI in Bhopal researches advanced materials and processes. This match correctly links each CSIR laboratory to its primary research mandate. These institutions represent the diverse scientific strengths of the Council of Scientific and Industrial Research across India.

99. (D) Remote sensing using satellite imagery
The Forest Survey of India primarily uses remote sensing technology for its biennial assessments. It interprets high-resolution satellite imagery to determine forest cover across the country, including Madhya Pradesh. This method provides a comprehensive and accurate spatial view of changes in forest density and area. While ground verification is done, satellite data is the main tool for mapping vast forest regions.

100. (D) Developing a manned submersible for human exploration at 6,000 metres depth
The Deep Ocean Mission is a flagship project of the Ministry of Earth Sciences. One of its central objectives is to develop a manned submersible, known as Matsya 6000, for deep-sea exploration. This submersible will allow scientists to study the ocean floor at depths of up to 6,000 meters. The mission also focuses on deep-sea mining and marine biodiversity research.

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CHAPTER 03
Satellite and Space Technology

1. What is the primary reason the Polar Satellite Launch Vehicle (PSLV) is preferred over the GSLV for launching Earth Observation satellites?
(A) PSLV possesses the capacity to carry much heavier payloads than the GSLV.
(B) PSLV exclusively utilizes cryogenic engines which provide better imaging stability.
(C) GSLV is currently restricted only to launching high-profile interplanetary missions.
(D) Earth Observation satellites require Sun-Synchronous Polar Orbits for mission needs.

2. NavIC, India's independent regional navigation satellite system, was previously known by which acronym?
(A) GAGAN
(B) Bhuvan
(C) IRNSS
(D) NETRA

3. Identify the correct statement regarding India's first satellite.
(A) Aryabhata was launched in 1975 using an indigenous SLV-3 launch vehicle.
(B) Rohini was the first Indian satellite to be launched in 1975.
(C) Aryabhata was launched in 1975 using a Soviet Kosmos-3M launch vehicle.
(D) Aryabhata was placed in a Geosynchronous orbit for communication purposes.

4. Despite the hard landing of the Vikram lander during the Chandrayaan-2 mission, which component continued to function and provide valuable scientific data?
(A) The Pragyan Rover
(B) The Surface Seismometer
(C) The Lunar Orbiter
(D) The sample return capsule

5. Consider the following statements regarding the applications of the Cartosat satellite series:
I. It is heavily utilized for detailed topographic mapping.
II. It is used for urban and rural infrastructure planning.
III. It performs deep space astronomical observations.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

6. The robotic rover deployed by the Chandrayaan-3 mission to conduct in-situ chemical analysis of the lunar surface is named:
(A) Vikram
(B) Pragyan
(C) Vyommitra
(D) Daksha

7. The Indian National Committee for Space Research (INCOSPAR), which laid the foundation for the Indian space programme, was established in which year?
(A) 1958
(B) 1962
(C) 1969
(D) 1972

8. Which of the following is not classified as an Earth Observation Satellite (EOS) by ISRO?
(A) RISAT
(B) IRNSS
(C) Cartosat
(D) SARAL

9. NavIC provides standard positioning services to civilian users using which specific frequency bands?
(A) Ku and Ka bands
(B) L5 and S bands
(C) X and C bands
(D) VHF and UHF bands

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10. Find the odd one out among the following Indian space assets.
(A) SLV
(B) ASLV
(C) INSAT
(D) PSLV

11. Which launch vehicle was successfully used to inject the Chandrayaan-3 spacecraft into its initial Earth parking orbit?
(A) PSLV-C55
(B) GSLV-F12
(C) SSLV-D2
(D) LVM3-M4

12. Match the following ISRO Launch Vehicles (List I) with their primary operational capability (List II):
List I: (ISRO Launch Vehicles)
P. SLV-3
Q. PSLV
R. GSLV Mk II
S. LVM3
List II: (Operational Capability)
1. Capable of placing 4000 kg class payloads into GTO
2. First successful indigenous vehicle to place 40 kg in LEO
3. Primarily used for placing Earth Observation Satellites into Sun-Synchronous Orbits
4. Uses an indigenous Cryogenic Upper Stage for 2000 kg class payloads to GTO
Select the correct answer from the codes given below:
(A) P-2, Q-3, R-4, S-1
(B) P-3, Q-2, R-1, S-4
(C) P-2, Q-3, R-1, S-4
(D) P-4, Q-1, R-3, S-2

13. Read the following assertion and reason and select the correct option.
Assertion (A): GSAT-3 (EDUSAT) was exclusively designed to serve the educational sector in India.
Reason (R): It employed multiple spot beams to provide specialized regional language content across different parts of the country.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

14. Identify the incorrect pair regarding Indian satellites and their primary functions.
(A) Oceansat - Identifying potential fishing zones
(B) Resourcesat - Crop inventory and vegetation monitoring
(C) EDUSAT - Weather forecasting and cyclone tracking
(D) Cartosat - High-resolution earth mapping

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15. Consider the following statements regarding the Chandrayaan-3 mission:
Statement I: The mission relied solely on the propulsion module to land directly on the lunar surface.
Statement II: The propulsion module carried a scientific payload called SHAPE to study Earth from lunar orbit.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

16. Which of the following best encapsulates Dr. Vikram Sarabhai's vision for the Indian space programme?
(A) Leveraging advanced space technologies for direct societal benefits
(B) Achieving total global military dominance through orbital weaponry
(C) Competing with major superpowers in manned lunar exploration missions
(D) Focusing exclusively on commercial deep space robotic mining operations

17. Select the correct chronological sequence of the following major ISRO missions from earliest to most recent.
(A) Chandrayaan-1, Mangalyaan, Chandrayaan-2, Aditya-L1
(B) Mangalyaan, Chandrayaan-1, Chandrayaan-2, Aditya-L1
(C) Chandrayaan-1, Chandrayaan-2, Mangalyaan, Aditya-L1
(D) Chandrayaan-1, Mangalyaan, Aditya-L1, Chandrayaan-2

18. Which specific engine technology is utilized in the third stage of the Geosynchronous Satellite Launch Vehicle (GSLV Mk II) to provide high thrust for reaching GTO?
(A) Cryogenic Upper Stage
(B) Solid Rocket Motor
(C) Earth Storable Liquid Engine
(D) Scramjet Engine

19. How many satellites currently constitute the space segment of the fully operational NavIC constellation?
(A) 4
(B) 5
(C) 7
(D) 9

20. The Ocean Colour Monitor (OCM) payload, useful for assessing phytoplankton concentration to aid fishermen, is a key instrument on which satellite?
(A) Oceansat-2
(B) Cartosat-3
(C) GSAT-30
(D) INSAT-3DR

21. What is the primary scientific reason ISRO chose the lunar south pole region for the Chandrayaan-3 landing?
(A) The terrain is significantly flatter and free of craters compared to the equator.
(B) This location ensures constant direct line-of-sight communication with Earth.
(C) Craters here are expected to contain significant water ice deposits.
(D) The region experiences a constant surface temperature of 20 degrees Celsius.

22. The Launch Vehicle Mark-3 (LVM3) has the capability to place approximately how much payload mass into Low Earth Orbit (LEO)?
(A) 2,000 kg
(B) 4,000 kg
(C) 8,000 kg
(D) 15,000 kg

23. The INSAT series of satellites is primarily deployed for which of the following applications?
(A) High-resolution topographic mapping and terrain modeling
(B) Deep space planetary exploration and asteroid tracking
(C) Tracking hostile military aircraft and naval movements
(D) Telecommunications, broadcasting, and meteorology

24. Which instrument on board India's Chandrayaan-1 mission was primarily responsible for confirming the presence of water molecules on the lunar surface?
(A) Terrain Mapping Camera (TMC)
(B) Lunar Laser Ranging Instrument (LLRI)
(C) Sub-keV Atom Reflecting Analyzer (SARA)
(D) Moon Mineralogy Mapper (M3)

25. Consider the following statements about the Cartosat-3 satellite:
Statement I: Cartosat-3 is a third-generation agile advanced satellite having high-resolution imaging capability.
Statement II: It has a panchromatic spatial resolution of better than 0.3 meters.
Which of the above statement(s) is/are correct?
(A) Statement I is true, Statement II is false.
(B) Statement I is false, Statement II is true.
(C) Both Statement I and Statement II are true.
(D) Both Statement I and Statement II are false.

26. Consider the following statements about the establishment of the Indian Space Research Organisation (ISRO):
Statement I: ISRO was formed on August 15, 1969, superseding INCOSPAR.
Statement II: ISRO was brought under the newly created Department of Space in 1972.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

27. What name was given to the exact location near the lunar south pole where the Chandrayaan-3 lander made its historic soft landing?
(A) Shiv Shakti Point
(B) Jawahar Point
(C) Tiranga Point
(D) Kalam Point

28. If the Indian Space Research Organisation needs to launch a heavy communication satellite

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weighing 3,800 kg into a Geosynchronous Transfer Orbit (GTO), which is the most appropriate launch vehicle to use?
(A) LVM3
(B) PSLV-XL
(C) GSLV Mk II
(D) SSLV

29. What is the designated primary service area of the NavIC navigation system?
(A) The entire terrestrial globe
(B) South Asian nations and the entire Middle East region
(C) Indian landmass and an area 1,500 km beyond its borders
(D) Indian Ocean Region extending towards the Antarctic zone

30. Which satellite series provides critical inputs for the National Agricultural Drought Assessment and Monitoring System (NADAMS) in India?
(A) GSAT series
(B) Astrosat
(C) NavIC series
(D) IRS Resourcesat series

31. Match the ISRO missions (List I) with their primary destinations or objectives (List II):
List I: (ISRO Missions)
P. Mangalyaan
Q. Aditya
R. Gaganyaan
S. Chandrayaan
List II: (Destinations/Objectives)
1. Low Earth Orbit human spaceflight
2. Lunar surface and orbit
3. Martian orbit
4. Sun-Earth Lagrange Point 1
Select the correct answer from the codes given below:
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-2, Q-4, R-1, S-3

32. Consider the following statements about satellite monitoring of forests in Madhya Pradesh:
Statement I: The Forest Survey of India (FSI) utilizes Indian Remote Sensing (IRS) satellite data to assess the forest cover of Madhya Pradesh biennially.
Statement II: Satellite imagery can easily distinguish between natural forests and artificial commercial plantations with 100% accuracy using basic optical sensors.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

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33. The Aditya-L1 spacecraft is placed in a halo orbit around the Lagrange point 1 (L1) of the Sun-Earth system. What is the approximate distance of L1 from Earth?
(A) 1.5 million kilometers
(B) 3.8 million kilometers
(C) 15 million kilometers
(D) 150 million kilometers

34. Match the Global Navigation Satellite Systems (List I) with their operating countries or unions (List II):
List I: (Global Navigation Satellite Systems)
P. GPS
Q. GLONASS
R. Galileo
S. BeiDou
List II: (Operating Country/Union)
1. Russia
2. European Union
3. United States
4. China
Select the correct answer from the codes given below:
(A) P-3, Q-1, R-2, S-4
(B) P-1, Q-3, R-4, S-2
(C) P-3, Q-2, R-1, S-4
(D) P-2, Q-4, R-1, S-3

35. Arrange the following commercial and regulatory entities of the Indian space sector in the correct chronological order of their establishment:
1. NewSpace India Limited (NSIL)
2. Antrix Corporation Limited
3. Indian National Space Promotion and Authorization Centre (IN-SPACe)
Select the correct sequence from the options given below:
(A) 1, 2, 3
(B) 2, 1, 3

(C) 2, 3, 1
(D) 3, 1, 2

36. For urban planning in Madhya Pradesh cities like Indore and Bhopal, GIS is highly effective because it allows for:
(A) Integrating and analyzing multiple layers like zoning and utilities
(B) The physical transportation of heavy construction materials
(C) Controlling traffic lights in real-time without physical sensors
(D) Generating electricity directly from incoming satellite signals

37. Consider the following payloads of the Aditya-L1 solar mission:
I. Visible Emission Line Coronagraph (VELC)
II. Solar Ultraviolet Imaging Telescope (SUIT)
III. Aditya Solar wind Particle Experiment (ASPEX)
IV. Lunar Seismic Profiling Experiment (LSPE)
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, III, and IV only

38. In Madhya Pradesh, the FASAL (Forecasting Agricultural output using Space, Agrometeorology and Land based observations) project heavily relies on remote sensing data primarily for:
(A) Mapping the specific genetic profile of local wheat varieties
(B) Tracking the seasonal migration patterns of agricultural laborers
(C) Calculating the exact minimum support prices for various grains
(D) Estimating crop acreage and forecasting production levels

39. Which ISRO-developed geo-portal provides free visualization of high-resolution spatial data, widely utilized by Madhya Pradesh state departments for land use and developmental planning?
(A) VEDAS
(B) MOSDAC
(C) NICES
(D) Bhuvan

40. The primary objective of placing the Aditya spacecraft at the L1 point rather than in Low Earth Orbit is to:
(A) Ensure the spacecraft receives stronger Earth-based telemetry signals.
(B) Keep the spacecraft protected from harmful solar flares by the Earth's magnetic field.
(C) Intercept solar winds before they reach the planet Venus.
(D) View the Sun continuously without any occultation or eclipses.

41. Consider the following statements regarding geospatial technologies:
Statement I: GPS is a technology used strictly to capture locational coordinates.
Statement II: GIS is a software framework used to store, analyze, and visualize geographic data.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

42. Under the Gaganyaan human spaceflight programme, what is the planned altitude of the Low Earth Orbit (LEO) intended for the crew module?
(A) 200 km
(B) 400 km
(C) 800 km
(D) 36,000 km

43. Consider the following applications of satellite technology in disaster management:
I. Pre-disaster vulnerability zoning
II. Real-time cyclone tracking
III. Inundation mapping during floods
IV. Post-disaster damage assessment
V. Predicting the exact magnitude of an impending earthquake
Which of the above statement(s) is/are correct?
(A) I, II, III, and IV only
(B) II, III, IV, and V only
(C) I, III, IV, and V only
(D) I, II, III, IV, and V

44. Identify the correct pair regarding the entities of the Indian space sector.
(A) NSIL - Focuses primarily on the management of all international and diplomatic space

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treaties
(B) Antrix Corporation - Established in the year 2020 to serve as the primary commercial arm
(C) ISTRAC - Responsible for the manufacturing of all heavy indigenous launch vehicles
(D) IN-SPACe - Acts as a single-window nodal agency for private space activities

45. What is the minimum number of GPS satellites a receiver must maintain line-of-sight with to accurately determine a 3D position (latitude, longitude, and altitude)?
(A) 2
(B) 3
(C) 4
(D) 6

46. India's Mars Orbiter Mission (Mangalyaan) was successfully launched in 2013 using which launch vehicle?
(A) GSLV-Mk III
(B) PSLV-C25
(C) ASLV-D4
(D) LVM3-M1

47. Find the odd one out among the following instruments or payloads in the context of their primary use in atmospheric and weather monitoring.
(A) Scatterometer
(B) Radar Altimeter
(C) Atmospheric Sounder
(D) Radiometer

48. Consider the following statements regarding 'Vyommitra':
Statement I: It is a half-humanoid robot developed by ISRO.
Statement II: It will fly aboard uncrewed test missions of Gaganyaan to simulate human functions.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

49. Which of the following is a significant limitation of using optical remote sensing satellites for disaster early warning systems?
(A) They cannot penetrate dense cloud cover during monsoons.
(B) They provide excessively wide area coverage patterns.
(C) They are highly effective at night without thermal sensors.
(D) They generate data that cannot be integrated into GIS.

50. Which of the following statements regarding the stages of the Small Satellite Launch Vehicle (SSLV) is incorrect?
(A) It is configured as a three-stage launch vehicle.
(B) It uses a solid propulsion system for its main stages.
(C) All three main stages of the SSLV are powered by liquid propulsion.
(D) It contains a liquid-propulsion-based Velocity Trimming Module (VTM) as a terminal stage.

51. Which of the following is not a common civilian application of the Global Positioning System (GPS)?
(A) Precision agriculture and tractor guidance
(B) Cadastral mapping and land surveying
(C) Fleet tracking and logistics management
(D) Guiding intercontinental ballistic missiles to a target

52. Which of the following statements about the Gaganyaan programme is incorrect?
(A) It aims to demonstrate human spaceflight capability by launching a crew of 3 members.
(B) The planned duration of the orbital mission is approximately 3 days.
(C) It includes a safe splashdown landing in Indian sea waters.
(D) The mission relies on the PSLV launch vehicle to carry the heavy crew module.

53. One of the key commercial advantages of the Small Satellite Launch Vehicle (SSLV) is its low turnaround time. Approximately how much time is required to integrate and prepare the SSLV for launch?
(A) A full integration cycle of 3 days
(B) Exactly 72 hours of integration time
(C) Approximately 72 hours with a minimal team

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(D) A standard integration cycle of 30 days

54. The Normalized Difference Vegetation Index (NDVI), derived from satellite imagery, is a crucial metric for monitoring forest health. It is calculated using the reflectance values of which two spectral bands?
(A) Blue and Green
(B) Thermal Infrared and Microwave
(C) Red and Near-Infrared (NIR)
(D) Ultraviolet and X-ray

55. How does a Doppler Weather Radar (DWR) complement satellite-based weather forecasting during extreme weather events in regions like central India?
(A) DWR provides real-time tracking of internal storm dynamics.
(B) DWR relies on deep space observation to detect incoming solar flares.
(C) DWR maps soil moisture independently of cloud cover unlike microwave units.
(D) DWR requires no external power supply, making it resilient during cyclones.

56. What defines a "Halo orbit" in the context of the Aditya-L1 mission?
(A) A 3D orbit near a Lagrange point kept stable by gravitational forces
(B) An orbit exclusively used to pass through planetary rings and belts
(C) A low altitude orbit that grazes the outer atmosphere of the solar body
(D) An orbit where the spacecraft travels faster than the local speed of light

57. In Geographic Information Systems (GIS), spatial data is generally represented in two primary formats. What are they?
(A) Vector and Raster
(B) Analog and Digital
(C) Binary and Hexadecimal
(D) Linear and Non-linear

58. The Small Satellite Launch Vehicle (SSLV) developed by ISRO is designed to cater to the emerging market of small satellites. What is its maximum payload capacity to a 500 km planar orbit?
(A) 100 kg
(B) 500 kg
(C) 1,500 kg
(D) 3,000 kg

59. Why is detecting isolated "cloud burst" events in hilly terrains using Geostationary satellite imagery often challenging?
(A) Geostationary satellites do not cover the Indian subcontinent.
(B) Geostationary satellites are only equipped with X-ray sensors.
(C) Rapid localization often exceeds satellite temporal and spatial limits.
(D) Cloud bursts do not contain moisture visible to most satellites.

60. Consider the following statements regarding commercial space activities in India:
Statement I: India routinely launches foreign customer satellites using the PSLV on a commercial basis.
Statement II: The revenue generated from these commercial launches is exclusively managed by the Ministry of External Affairs.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

61. The GSAT-7 satellite, also known as Rukmini, is India's first dedicated military communication satellite primarily serving which branch of the armed forces?
(A) Indian Army
(B) Indian Air Force
(C) Indian Navy
(D) Border Security Force

62. What is the most significant economic impact expected from the successful development of ISRO's Reusable Launch Vehicle (RLV)?
(A) Reducing the cost of space access by recovering hardware
(B) Immediate privatization of all existing ISRO facilities
(C) Complete elimination of the need for ground control stations
(D) A shift towards launching only foreign commercial satellites

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63. Under the AMRUT scheme, GIS technology is mandated for cities in Madhya Pradesh primarily to:
(A) Develop master plans using geospatial utility mapping
(B) Monitor atmospheric pollution levels over urban slums
(C) Direct satellite broadband to every local household
(D) Assess deep space mining opportunities for minerals

64. 'Shukrayaan-1' is a planned future interplanetary mission by ISRO intended to study which celestial body?
(A) Jupiter
(B) Saturn
(C) Venus
(D) Mercury

65. Identify the correct pair regarding India's defence satellites.
(A) EMISAT - Electronic intelligence satellite operated by DRDO
(B) GSAT-7 (Rukmini) - Dedicated to the Indian Air Force
(C) GSAT-7A (Angry Bird) - Dedicated to the Indian Navy
(D) RISAT-2BR1 - A deep space exploration probe

66. What was the primary purpose behind establishing Village Resource Centres (VRCs) by ISRO in various states including Madhya Pradesh?
(A) To provide single-window delivery for space-based rural services
(B) To recruit and train potential astronaut candidates from rural districts
(C) To establish localized manufacturing units for small sounding rocket parts
(D) To serve as regional command and control centers for military spacecraft

67. Under the Rajiv Gandhi National Drinking Water Mission, satellite remote sensing was extensively used for which critical application?
(A) Purifying contaminated surface water sources
(B) Desalination of seawater for coastal regions
(C) Preparing groundwater prospect maps for drilling
(D) Constructing large-scale dam infrastructures

68. Which technological innovation pioneered by SpaceX has fundamentally disrupted the global commercial launch sector by drastically reducing costs?
(A) Use of solid propellants in all stages
(B) Propulsive landing and reuse of the first stage booster
(C) Nuclear-powered upper stages
(D) Development of expendable single-stage-to-orbit vehicles

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69. In which year was IN-SPACe (Indian National Space Promotion and Authorization Centre) established to spearhead the liberalization of the Indian space sector?
(A) 2014
(B) 2018
(C) 2020
(D) 2023

70. ISRO launched 'Project NETRA' to address orbital sustainability. What is the primary objective of this project?
(A) Establishing an early warning system in space to detect hostile missile launches
(B) Developing a laser weapon to vaporize space debris
(C) Creating an indigenous SSA network for debris tracking
(D) Designing reusable launch vehicles

71. Consider the following statements about satellite-based telemedicine in Madhya Pradesh:
Statement I: It involves setting up remote diagnostic nodes in district or rural hospitals linked to specialty hospitals in major cities via INSAT/GSAT satellites.
Statement II: Telemedicine requires physical transportation of the patient to the specialty hospital for the preliminary diagnosis to occur.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

72. Municipal corporations in Madhya Pradesh are increasingly utilizing high-resolution drone

and satellite imagery. What is a direct financial benefit of this application for urban local bodies?
(A) It reduces the cost of launching indigenous satellites.
(B) It helps in unearthing under-assessed properties for tax.
(C) It generates funds from international space agencies.
(D) It reduces the need for the collection of water taxes.

73. Which of the following does not represent an ongoing or planned international collaboration involving the Indian space programme?
(A) LUPEX mission with Japan
(B) TRISHNA mission with France
(C) NISAR mission with the USA
(D) Joint manned lunar outpost with China

74. Find the odd one out concerning regions with the highest concentration of space debris.
(A) Low Earth Orbit (LEO)
(B) Geosynchronous Orbit (GEO)
(C) Lunar Transfer Trajectory
(D) Sun-Synchronous Orbit (SSO)

75. Match the Space technology applications (List I) with their corresponding rural/social welfare linkage in India (List II):
List I: (Space Technology Applications)
P. Tele-education
Q. Tele-medicine
R. Bhuvan-Panchayat
S. Village Resource Centres (VRC)
List II: (Social Welfare Linkage)
1. Empowering local governance and decentralized planning
2. Connecting rural hospitals with super-specialty doctors via satellite
3. Delivering expert lectures to remote tribal schools
4. Interactive hubs providing space-enabled services directly to rural communities
Select the correct answer from the codes given below:
(A) P-3, Q-2, R-1, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-4, Q-1, R-2, S-3
(D) P-3, Q-4, R-1, S-2

76. Consider the following applications of space technology in water resource management in Madhya Pradesh:
I. Assessment of reservoir sedimentation and capacity estimation
II. Mapping of deep ocean salinity levels
III. Irrigation command area monitoring
Which of the above combinations represents incorrect applications in the context of landlocked Madhya Pradesh?
(A) I only
(B) II only
(C) III only
(D) I and III only

77. Which of the following is a direct effect of the liberalization of the Indian space sector on NewSpace India Limited (NSIL)?
(A) NSIL was dissolved and replaced by IN-SPACe.
(B) NSIL lost the right to interact with foreign satellite customers.
(C) NSIL shifted its headquarters to Washington D.C.
(D) NSIL assumed a demand-driven model for operations.

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78. Read the following assertion and reason and select the correct option.
Assertion (A): The Kessler Syndrome is a major concern for the sustainability of Low Earth Orbits (LEO).
Reason (R): It postulates that the density of space debris could become so high that collisions generate cascading debris, making the orbit unusable.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

79. The global private space sector is heavily investing in mega-constellations like Starlink. In which orbital regime are the vast majority of these satellites being deployed?
(A) Medium Earth Orbit (MEO)
(B) Low Earth Orbit (LEO)
(C) Geostationary Orbit (GEO)
(D) Highly Elliptical Orbit (HEO)

80. The NISAR mission is a joint Earth-observing mission combining two different radar frequencies. Which two space agencies are collaborating on this project?
(A) ISRO and ESA (European Space Agency)
(B) ISRO and Roscosmos
(C) ISRO and JAXA
(D) ISRO and NASA

81. While the BharatNet project relies heavily on optical fibre for rural broadband connectivity, satellite backhaul is crucial for:
(A) Urban metropolitan cities with high population density
(B) Providing connectivity to undersea naval submarines
(C) Remote terrains where laying fibre is structurally unfeasible
(D) Linking computers within a single local government office

82. While satellite remote sensing is highly useful for water resource management, which of the following tasks can it not perform directly with high precision?
(A) Direct volumetric measurement of deep aquifers
(B) Delineation of surface water bodies
(C) Mapping of snow cover and glacial melt
(D) Identifying areas prone to waterlogging

83. According to the Inter-Agency Space Debris Coordination Committee (IADC) guidelines, what is the recommended maximum time a satellite should remain in Low Earth Orbit (LEO) after its operational life ends?
(A) 5 years
(B) 10 years
(C) 25 years
(D) 50 years

84. Under the Indian Space Policy 2023, what is defined as the primary role of ISRO moving forward?
(A) Focusing on mass production of operational launch vehicles
(B) Monopolizing all commercial space launches globally
(C) Focusing on advanced R&D and new technologies
(D) Operating direct-to-home television services

85. Consider the following statements regarding the Artemis Accords:
Statement I: It is a US-led international agreement establishing a framework for responsible space exploration, primarily focused on returning humans to the Moon.
Statement II: India formally signed the Artemis Accords in 2023.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

86. Consider the following statements regarding urban remote sensing:
Statement I: Multi-temporal satellite data is highly effective in monitoring urban sprawl and land-use changes over decades.
Statement II: High-resolution satellite images cannot be used to detect illegal constructions within city limits.
Which of the above statement(s) is/are correct?
(A) Statement I is true, Statement II is false.
(B) Statement I is false, Statement II is true.
(C) Both Statement I and Statement II are true.
(D) Both Statement I and Statement II are false.

87. Consider the following statements regarding the Bharatiya Antariksh Station (BAS):
Statement I: It is India's proposed independent space station to be placed in Low Earth Orbit.
Statement II: The complete operational establishment of BAS is officially targeted for the year 2025.
Which of the above statement(s) is/are correct?
(A) Statement I only
(B) Statement II only
(C) Both Statement I and Statement II
(D) Neither Statement I nor Statement II

88. In 2019, India conducted an Anti-Satellite (ASAT) test named 'Mission Shakti'. Why was a relatively low altitude (around 300 km) chosen for intercepting the target satellite?
(A) Because it is the optimal altitude for indigenous radar tracking systems.
(B) To minimize long-term orbital hazards via rapid atmospheric decay.
(C) Due to limitations in the propulsion systems of early-stage interceptors.

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(D) To ensure full compliance with international space treaties and safety.

89. Consider the following functions:
I. Promoting and handholding private space entities in India
II. Authorizing the launch of private satellites and rockets
III. Designing highly classified military satellites
IV. Sharing ISRO's technical facilities with non-governmental entities
Which of the above statement(s) is/are correct roles and responsibilities of IN-SPACe?
(A) I, II, and III only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, III, and IV only

90. Select the correct sequence of the following Earth orbits arranged in ascending order of their typical operational altitudes.
(A) LEO, MEO, GEO
(B) MEO, LEO, GEO
(C) GEO, MEO, LEO
(D) LEO, GEO, MEO

91. What is the most appropriate description of the benefit provided by EDUSAT to tribal and rural students in Madhya Pradesh?
(A) It provides them with free laptops and internet routers.
(B) It bridges the divide by broadcasting quality educational content.
(C) It monitors the attendance of students via high-resolution imagery.
(D) It provides real-time geographic data for school construction.

92. Historically, the Jhabua Development Communications Project (JDCP) in Madhya Pradesh was a milestone in utilizing space technology. What was its main focus?
(A) Mineral exploration using synthetic aperture radar technology
(B) Launching small sounding rockets from the Jhabua district
(C) Satellite-based interactive broadcasting for rural development
(D) Managing urban traffic control through geospatial monitoring

93. Which of the following is a recognized technical limitation of Geostationary satellite internet when compared to terrestrial fibre optics, impacting real-time digital applications in rural areas?
(A) Inability to reach remote areas
(B) Complete signal blockage during nighttime
(C) Satellites can only transmit text data
(D) High signal latency due to orbital distance

94. The GramSAT programme was conceptualized by ISRO primarily to:
(A) Monitor agricultural fields for illegal crop burning
(B) Launching micro-satellites built by rural school students
(C) Provide a dedicated satellite network for rural development
(D) Measure groundwater levels in drought-prone villages

95. Find the odd one out among the following space applications concerning rural development.
(A) Deep space asteroid mining
(B) Tele-medicine
(C) Tele-education
(D) Disaster warning systems

96. Arrange the logical sequence of communication flow in a typical satellite-based Telemedicine consultation:
1. Signal beamed to Communication Satellite
2. Remote Patient Node (collects vitals/video)
3. Specialist Hospital Hub
4. Satellite downlinks data to Earth Station
Select the correct sequence from the options below:
(A) 2, 1, 4, 3
(B) 1, 2, 3, 4
(C) 3, 4, 1, 2
(D) 2, 4, 1, 3

97. A major socio-economic effect of integrating Space Technology with the Digital India initiative is:
(A) Bridging the digital divide via rural e-governance and health
(B) Complete replacement of physical banks with satellite nodes
(C) Centralizing all rural populations into large smart cities

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(D) Increasing the cost of basic internet services for rural users

98. Consider the following components of a telemedicine network:
I. Very Small Aperture Terminal (VSAT) antenna
II. Medical diagnostic instruments (ECG, X-Ray digitizer)
III. Geostationary communication satellite
IV. Super-specialty hospital hub
V. Cryogenic engine
Which combination includes an incorrect component for establishing a functional telemedicine network?
(A) I and II only
(B) II, III, and IV only
(C) V only
(D) I, III, and V only

99. Identify the correct pair regarding frequency bands used in satellite communication.
(A) C-band - Highly susceptible to rain attenuation (rain fade)
(B) Ku-band - Requires very large dish antennas for reception
(C) S-band - Primarily used for deep space optical communications
(D) Ka-band - Offers higher bandwidth and data rates suitable for broadband

100. Match the following major ISRO centres (List I) with their primary locations (List II):
List I: (ISRO Centres)
P. U R Rao Satellite Centre (URSC)
Q. Space Applications Centre (SAC)
R. Vikram Sarabhai Space Centre (VSSC)
S. National Remote Sensing Centre (NRSC)
List II: (Locations)
1. Thiruvananthapuram
2. Ahmedabad
3. Bengaluru
4. Hyderabad
Select the correct answer from the codes given below:
(A) P-3, Q-2, R-1, S-4
(B) P-1, Q-2, R-3, S-4
(C) P-3, Q-4, R-1, S-2
(D) P-2, Q-3, R-4, S-1

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ANSWERS

1. (D) Earth Observation satellites require Sun-Synchronous Polar Orbits for mission needs.
Earth observation satellites usually operate in Sun-Synchronous Polar Orbits to maintain consistent lighting conditions for imaging. The Polar Satellite Launch Vehicle is specifically designed to inject payloads into these orbits with high precision. While the GSLV is more powerful for high-altitude missions, the PSLV remains the primary choice for monitoring resources and managing environmental data globally.

2. (C) IRNSS
The Indian Regional Navigation Satellite System is the formal technical designation for the project now known as NavIC. This independent system provides accurate position information service to users in India as well as the region extending up to fifteen hundred kilometers. It was developed to ensure national autonomy in critical navigation and timing services across various sectors.

3. (C) Aryabhata was launched in 1975 using a Soviet Kosmos-3M launch vehicle.
India entered the space age with the launch of its first satellite named after the ancient astronomer Aryabhata. This historic mission took place on April 19, 1975, utilizing a Soviet Kosmos-3M rocket from the Kapustin Yar launch site. The satellite was designed for scientific experiments in X-ray astronomy and solar physics during its operational life in space.

4. (C) The Lunar Orbiter
Although the lander failed to achieve a soft landing on the moon, the lunar orbiter successfully entered its intended path. It carries high-resolution cameras and spectroscopic instruments that continue to map the lunar surface and study its mineral composition. This component remains fully operational, providing the global scientific community with significant data regarding the south polar region.

5. (A) I and II only
The Cartosat satellite series is primarily designed for high-resolution Earth imaging used in cartographic applications. These satellites provide data for mapping topography and supporting urban and rural infrastructure development projects across the country. They are not intended for deep space observations or astronomical research, as their sensors are optimized specifically for capturing detailed features of the terrestrial surface.

6. (B) Pragyan
The lunar rover named Pragyan was a key component of the successful Chandrayaan-3 mission. This six-wheeled robotic vehicle was designed to move across the lunar surface and conduct chemical analysis of soil and rocks. It used instruments like the Alpha Particle X-ray Spectrometer to identify elements and minerals near the landing site in the south pole.

7. (B) 1962
The Indian National Committee for Space Research was established under the leadership of Dr. Vikram Sarabhai in 1962. It operated under the Department of Atomic Energy to spearhead the nation's early space efforts. This committee was the predecessor to the current space agency and played a pivotal role in setting up the Thumba Equatorial Rocket Launching Station.

8. (B) IRNSS
Earth Observation Satellites like RISAT and Cartosat are equipped with sensors to monitor terrestrial resources and environmental changes. In contrast, the Indian Regional Navigation Satellite System is dedicated to providing positioning, navigation, and timing services. It consists of a constellation of satellites that allow users to determine their exact location, which differs from the primary function of imaging.

(B) L5 and S bands
NavIC utilizes the L5 and S bands to provide standard positioning services for civilian applications and restricted services for authorized users. These frequency bands ensure better accuracy and signal reliability across the Indian landmass. By using multiple frequencies, the

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system can compensate for ionospheric delays, which is essential for maintaining high precision in navigation and timing for diverse users.

10. (C) INSAT
The Indian National Satellite System refers to a series of multipurpose geostationary satellites used for telecommunications and meteorology. Unlike the SLV, ASLV, and PSLV, which are launch vehicles designed to carry payloads into space, this system represents the actual satellites in orbit. This distinction separates the infrastructure used for transportation from the operational technology utilized for communication services.

11. (D) LVM3-M4
The LVM3-M4 vehicle served as the primary launcher for the Chandrayaan-3 mission, demonstrating its capability to carry heavy payloads. It successfully placed the integrated spacecraft into an Earth parking orbit before the module began its journey toward the moon. This vehicle is the most powerful in the current fleet and is essential for India's ambitious deep-space exploration programs.

12. (A) P-2, Q-3, R-4, S-1
India's launch vehicle evolution began with the SLV-3 placing small payloads in low orbit. The PSLV became the primary vehicle for sun-synchronous missions, while the GSLV Mk II introduced indigenous cryogenic technology for mid-range payloads. The LVM3 now provides the heavy-lift capability required for four-ton class communication satellites and complex interplanetary missions, ensuring a versatile range of orbital access.

13. (A) Both A and R are true and R is the correct explanation of A.
GSAT-3 was the first Indian satellite built exclusively for the educational sector to facilitate distance learning. It utilized various spot beams to deliver regional language content, effectively reaching remote areas across the country. This technology allowed for interactive classrooms and the dissemination of information to students in diverse geographical locations, fulfilling a critical need for accessible education via satellite.

14. (C) EDUSAT - Weather forecasting and cyclone tracking
While Oceansat and Resourcesat are dedicated to marine and agricultural monitoring respectively, EDUSAT was specifically designed for the educational sector. It provided satellite-based classrooms and distance learning opportunities rather than weather forecasting or cyclone tracking. Meteorological functions are primarily handled by the INSAT and Kalpana series, which carry specialized instruments for monitoring atmospheric conditions and predicting natural disasters.

15. (B) Statement II only
The propulsion module of the Chandrayaan-3 mission played a vital role in carrying the lander toward the lunar orbit. Additionally, it remained in orbit to perform scientific research using the SHAPE payload, which analyzes Earth's spectro-polarimetric signatures. This allows scientists to study habitability traits from a distance, while the landing was performed by the dedicated Vikram lander module.

16. (A) Leveraging advanced space technologies for direct societal benefits
The founder of the Indian space program envisioned using advanced technology to address the real problems of man and society. Rather than focusing on military dominance or competing with superpowers, the goal was to apply space research to fields like communication, meteorology, and resource management. This philosophy continues to guide the development of satellites that provide direct benefits to citizens.

17. (A) Chandrayaan-1, Mangalyaan, Chandrayaan-2, Aditya-L1
India's major space missions followed a specific timeline starting with the first lunar probe in 2008. This was followed by the Mars Orbiter Mission in 2013 and the second lunar mission in 2019. Most recently, the Aditya-L1 solar mission was launched in 2023. This sequence highlights the progressive expansion of the national space program from the moon to interplanetary exploration.

18. (A) Cryogenic Upper Stage
The Geosynchronous Satellite Launch Vehicle Mk II employs a Cryogenic Upper Stage as its

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third stage for enhanced performance. This stage uses liquid oxygen and liquid hydrogen as propellants to provide the high specific impulse needed for placing satellites into transfer orbits. The development of this indigenous technology was a major milestone, giving the nation self-reliance in launching heavy communication satellites.

19. (C) 7
The NavIC system is supported by a space segment consisting of seven active satellites in the constellation. Three of these satellites are positioned in geostationary orbits, while the remaining four are in inclined geosynchronous orbits. This configuration ensures continuous coverage over the Indian subcontinent and the surrounding region, providing reliable navigation and timing data for both civilian and strategic applications.

20. (A) Oceansat-2
The Ocean Colour Monitor is a sophisticated multispectral sensor used to observe various biological and physical parameters of the sea. It is a primary instrument on the Oceansat series, providing data on chlorophyll concentration and suspended sediments. This information is vital for identifying potential fishing zones, helping fishermen improve their catch efficiency while also supporting marine ecosystem research and management.

21. (C) Craters here are expected to contain significant water ice deposits.
Exploring the lunar south pole is scientifically significant because the region contains permanently shadowed craters. These areas are believed to host substantial deposits of water ice, which could be vital for future human exploration and life support. Understanding the distribution and chemistry of this water is a major objective for missions seeking to uncover the moon's geological and volatile history.

22. (C) 8,000 kg
The LVM3 is a heavy-lift launch vehicle designed to carry significant payloads into various orbits. It has the capacity to place approximately eight thousand kilograms into Low Earth Orbit, making it suitable for launching space station modules and crewed missions. Its robust design and high thrust capabilities also allow it to deliver four-ton class communication satellites into Geosynchronous Transfer Orbits efficiently.

23. (D) Telecommunications, broadcasting, and meteorology
The Indian National Satellite System is a versatile network used for multiple domestic applications. It plays a critical role in telecommunications by providing high-speed connectivity and supporting television broadcasting across the country. Furthermore, these satellites carry meteorological instruments that assist in weather forecasting and disaster warning, making them essential for public safety and the national economy.

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24. (D) Moon Mineralogy Mapper (M3)
The Moon Mineralogy Mapper was an advanced imaging spectrometer provided by NASA for the first Indian lunar mission. This instrument was instrumental in detecting the absorption features of water and hydroxyl molecules on the lunar surface. Its data confirmed that the moon is not completely dry, a discovery that fundamentally changed the scientific understanding of lunar geology and future resource potential.

25. (C) Both Statement I and Statement II are true.
Cartosat-3 represents a major advancement in high-resolution imaging technology for the national space program. It is an agile satellite capable of capturing very detailed images with a spatial resolution of less than thirty centimeters. This capability is essential for diverse applications such as large-scale urban planning, coastal land use monitoring, and precise mapping of infrastructure and natural resources across the country.

26. (C) Both Statement I and Statement II
The space agency was formally established in 1969 to consolidate the nation's space research activities under a single organization. A few years later, in 1972, the government created the Department of Space and placed the agency under its administrative control. This institutional framework provided the necessary support and funding to develop indigenous launch vehicles and satellites for various national applications.

27. (A) Shiv Shakti Point
The landing site of the Chandrayaan-3 mission was officially named to commemorate the historic achievement of reaching the lunar south pole. This location marks the spot where the lander successfully performed a soft landing, making the nation the first to reach this specific region. The name symbolizes the integration of scientific endeavor and national pride in successfully executing a complex mission.

28. (A) LVM3
To launch a heavy communication satellite weighing nearly four tons, the most capable vehicle in the current fleet is required. The LVM3 is specifically designed for such heavy-lift requirements, providing the necessary thrust to reach the Geosynchronous Transfer Orbit. This vehicle ensures that large payloads can be delivered reliably, supporting the nation's growing needs for high-capacity telecommunications and broadcasting services.

29. (C) Indian landmass and an area 1,500 km beyond its borders
NavIC is designed to provide accurate positioning services over the primary service area encompassing the Indian landmass. The coverage also extends up to fifteen hundred kilometers beyond the national borders to serve regional users. This ensures that the system provides reliable data for navigation, disaster management, and fleet tracking across the subcontinent and the neighboring maritime regions in the Indian Ocean.

30. (D) IRS Resourcesat series
The Resourcesat series provides high-quality multispectral data that is essential for monitoring the country's agricultural health. This information is used by the national drought assessment system to track crop conditions and soil moisture levels. By analyzing satellite imagery, authorities can identify areas experiencing water stress and provide timely warnings, helping in the effective management of agricultural resources and food security.

31. (A) P-3, Q-4, R-1, S-2
India's diverse space missions target various scientific objectives and destinations. Mangalyaan was sent to explore the Martian atmosphere, while the Aditya mission observes the Sun from a stable Lagrange point. Gaganyaan is focused on developing human spaceflight capability in low Earth orbit. Meanwhile, the Chandrayaan series continues to investigate the lunar surface and its mineral composition through landers and orbiters.

32. (A) Statement I only
The Forest Survey of India relies on remote sensing data from indigenous satellites to monitor changes in forest cover every two years. While these sensors provide detailed information, they cannot distinguish between natural forests and commercial plantations with absolute certainty using only basic optical data. Accurate classification often requires additional field validation and the use of advanced multispectral analysis techniques.

33. (A) 1.5 million kilometers
The first Lagrange point is a gravitationally stable location in space situated between the Earth and the Sun. It is located approximately 1.5 million kilometers away from our planet, which is about four times the distance to the moon. Placing a spacecraft at this point allows it to maintain a continuous, unobstructed view of the Sun for scientific solar observations.

34. (A) P-3, Q-1, R-2, S-4
Global navigation systems are operated by different nations to provide independent positioning services. The United States maintains the GPS network, while Russia operates GLONASS and the European Union manages Galileo. China has developed the BeiDou system for global coverage. Each system uses a constellation of satellites to ensure that users worldwide can determine their precise coordinates and time at any location.

35. (B) 2, 1, 3
The commercialization of the Indian space sector began with the establishment of Antrix in 1992 to market space products and services. Decades later, NewSpace India Limited was formed in 2019 to handle the commercial production of launch vehicles and satellites. Finally, the regulatory body IN-SPACe was created in 2020 to authorize and promote the involvement of private entities in space.

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36. (A) Integrating and analyzing multiple layers like zoning and utilities
Geographic Information Systems are essential for modern urban planning as they allow for the integration of diverse spatial data layers. Planners can analyze information regarding land use, utility networks, and zoning regulations simultaneously to make informed decisions. This technology helps in visualizing the impact of proposed developments, optimizing resource allocation, and improving the overall management of rapidly growing metropolitan areas.

37. (A) I, II, and III only
The Aditya-L1 mission carries several specialized instruments to study solar phenomena. These include the coronagraph for observing the Sun's outer atmosphere and the ultraviolet telescope for imaging the solar disc. Additionally, the solar wind particle experiment analyzes the properties of particles emitted by the Sun. These payloads work together to provide a comprehensive understanding of solar dynamics and space weather.

38. (D) Estimating crop acreage and forecasting production levels
The FASAL project utilizes remote sensing data to provide reliable estimates of agricultural production before the harvest. By analyzing satellite imagery, experts can calculate the total area under cultivation for various crops and monitor their growth throughout the season. This information is critical for making informed decisions regarding food policy, market pricing, and the management of national food reserves.

39. (D) Bhuvan
Bhuvan is a versatile geo-portal that offers a wide range of geospatial data and services for various developmental activities. It allows users to visualize high-resolution satellite imagery and access tools for analyzing land use, water resources, and urban growth. Many state departments use this platform for decentralized planning and monitoring the progress of government schemes at the grassroots level.

40. (D) View the Sun continuously without any occultation or eclipses.
Positioning a solar observatory at the L1 point provides a significant advantage for continuous monitoring. From this location, the spacecraft can view the Sun without any interruptions caused by Earth's shadow or atmospheric interference. This allows for constant tracking of solar flares and other energetic events, which is essential for understanding their impact on space weather and communication systems on Earth.

41. (C) Both Statement I and Statement II
Geospatial technologies encompass various tools for capturing and managing spatial data. Global positioning systems are used primarily to determine precise locational coordinates using satellite signals. Geographic Information Systems provide the software environment to store, analyze, and visualize this information. Together, these technologies enable users to map complex geographic features and perform detailed spatial analysis for planning and resource management.

42. (B) 400 km
The upcoming human spaceflight mission aims to place a crew module in a circular orbit around the Earth. The planned altitude for this mission is approximately four hundred kilometers, which is within the Low Earth Orbit regime. This altitude allows the spacecraft to remain close to the planet while providing a microgravity environment for conducting scientific experiments during the mission.

43. (A) I, II, III, and IV only
Satellites play a comprehensive role in managing natural disasters through various stages. They assist in mapping vulnerable zones before an event and provide real-time tracking of phenomena like cyclones. During floods, they offer critical inundation maps to guide rescue efforts. After the disaster, high-resolution imagery is used for damage assessment, although they currently cannot predict the exact timing of earthquakes.

44. (D) IN-SPACe - Acts as a single-window nodal agency for private space activities
The Indian National Space Promotion and Authorization Centre serves as an independent nodal agency to facilitate the participation of private players in the space sector. It provides a

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single-window clearance for non-governmental entities to carry out space activities, including the launch of rockets and satellites. This organization acts as a bridge between the government and the emerging private space industry.

45. (C) 4
To calculate a precise three-dimensional position consisting of latitude, longitude, and altitude, a receiver must process signals from at least four satellites. While three satellites can provide a 2D location, the fourth signal is necessary to synchronize the receiver's clock and determine the height. Maintaining line-of-sight with more satellites further improves the overall accuracy and reliability of the position.

46. (B) PSLV-C25
The Mars Orbiter Mission, popularly known as Mangalyaan, was launched using the PSLV-C25 vehicle. This mission demonstrated the capability to reach another planet on the very first attempt using a cost-effective approach. The launch vehicle was configured to provide the necessary velocity for the spacecraft to break Earth's gravity and enter a trajectory toward the red planet's orbit for scientific study.

47. (B) Radar Altimeter
Most atmospheric sensors are designed to measure variables like wind speed, humidity, and temperature profiles. Scatterometers and radiometers are commonly used to observe ocean surface winds and thermal emissions for weather forecasting. In contrast, a radar altimeter is primarily used to measure the height of the sea surface or land topography, which is more related to geophysics than daily meteorology.

48. (C) Both Statement I and Statement II
Vyommitra is an advanced humanoid robot designed to function in the microgravity environment of space. It is intended to fly on uncrewed missions to test the life support systems and simulate human activities inside the crew module. This robot can monitor cabin parameters and interact with control systems, providing valuable data to ensure the safety of astronauts in future manned flights.

49. (A) They cannot penetrate dense cloud cover during monsoons.
Optical sensors rely on visible and infrared light to capture images of the Earth's surface. A major drawback of this technology is its inability to see through thick clouds, which often accompany severe weather events and monsoons. This limitation can hinder the timely acquisition of imagery during floods or cyclones, making microwave radar sensors a necessary complement for consistent disaster monitoring.

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50. (C) All three main stages of the SSLV are powered by liquid propulsion.
The Small Satellite Launch Vehicle is a three-stage rocket designed for rapid deployment and low-cost access to space. All three of its primary stages utilize solid propulsion to simplify operations and reduce turnaround time. It also features a liquid-based Velocity Trimming Module to ensure precise orbital placement. Claims that its main stages are liquid-powered are incorrect given its solid-fuel design.

51. (D) Guiding intercontinental ballistic missiles to a target
Global positioning technology has become a standard tool for numerous civilian tasks. It is used in precision agriculture to guide machinery and in surveying to create accurate land maps. Logistics companies also rely on it to track vehicles and optimize delivery routes. However, guiding long-range military missiles is a restricted strategic application rather than a common civilian use of the technology.

52. (D) The mission relies on the PSLV launch vehicle to carry the heavy crew module.
The human spaceflight program is designed to demonstrate the capability to launch astronauts and return them safely. The mission will utilize the LVM3, which is the nation's most powerful rocket, to carry the heavy crew and service modules. The suggestion that a PSLV could be used for this purpose is incorrect due to the vehicle's limited payload capacity for such missions.

53. (C) Approximately 72 hours with a minimal team
One of the primary advantages of the Small Satellite Launch Vehicle is its ability to be integrated quickly with minimal infrastructure.

It is designed to be ready for launch in approximately seventy-two hours using a small team of personnel. This rapid turnaround time makes it an attractive option for commercial customers who need to deploy small satellite constellations on short notice.

54. (C) Red and Near-Infrared (NIR)
The health and density of vegetation are often measured using the ratio of reflected light in specific wavelengths. Healthy plants reflect a large amount of near-infrared light while absorbing most of the red light for photosynthesis. By comparing the reflectance values of these two bands, scientists can calculate an index that indicates the greenness and productivity of forests and agricultural fields.

55. (A) DWR provides real-time tracking of internal storm dynamics.
Doppler Weather Radars provide high-resolution data on the movement and intensity of precipitation within localized areas. Unlike satellites that observe clouds from above, these ground-based systems can detect the internal wind patterns and velocity of a storm. This information is crucial for predicting severe weather events like thunderstorms and heavy rainfall, allowing for better early warning and disaster preparedness.

56. (A) A 3D orbit near a Lagrange point kept stable by gravitational forces
A halo orbit is a periodic, three-dimensional path that a spacecraft follows near a Lagrange point. This type of orbit is maintained through a delicate balance of the gravitational pull from two large bodies, such as the Sun and the Earth. It allows the spacecraft to remain in a stable position relative to these bodies while avoiding interference from their shadows.

57. (A) Vector and Raster
Geographic Information Systems organize spatial data into two fundamental structures. Vector data represents features as points, lines, or polygons, which is ideal for mapping discrete objects like roads and boundaries. Raster data uses a grid of cells or pixels to represent continuous surfaces, such as satellite imagery or elevation models. Both formats are essential for comprehensive spatial analysis and visualization.

58. (B) 500 kg
The Small Satellite Launch Vehicle is tailored to meet the growing demand for launching light payloads. It is capable of delivering up to five hundred kilograms to a low Earth orbit at an altitude of five hundred kilometers. This capacity makes it suitable for individual small satellites or clusters of nano-satellites, providing a dedicated and cost-effective solution for various commercial users.

59. (C) Rapid localization often exceeds satellite temporal and spatial limits.
Cloud bursts are extreme localized rainfall events that develop and dissipate very quickly over small areas. Detecting these events from geostationary orbits is difficult because the temporal resolution and spatial detail may not be sufficient to capture the rapid development of such small-scale storms. Improving the monitoring of these phenomena requires a combination of high-resolution satellite data and ground-based radar systems.

60. (A) Statement I only
The national space agency has built a strong reputation for launching satellites from various countries on a commercial basis. These missions are primarily carried out using the PSLV, which is known for its high reliability and precision. While the agency performs the launches, the commercial aspects and revenue are managed by dedicated corporate arms rather than the ministry responsible for foreign affairs.

61. (C) Indian Navy
The GSAT-7 satellite was a significant milestone as the first dedicated communication satellite for maritime applications. It provides high-speed data links and secure communication capabilities to ships and aircraft operating in the Indian Ocean. This satellite allows the naval forces to maintain connectivity over vast distances, enhancing their operational efficiency and situational awareness across the region's critical maritime boundaries.

62. (A) Reducing the cost of space access by recovering hardware
Developing a reusable launch vehicle is a key strategic goal to lower the expenses associated with space missions. By recovering and reusing the first stage or other components of the rocket,

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the cost per launch can be significantly reduced. This technology makes space more accessible for both scientific research and commercial applications, fostering a more sustainable and competitive space industry globally.

63. (A) Develop master plans using geospatial utility mapping
For urban development under national schemes, cities use geospatial tools to create comprehensive master plans. These systems allow municipal authorities to map essential utilities like water supply, sewerage, and electricity networks with high precision. By integrating this data into a GIS framework, planners can better manage infrastructure, optimize service delivery, and ensure systematic growth in rapidly developing urban centers.

64. (C) Venus
Future interplanetary exploration plans include a dedicated mission to study the atmosphere and surface characteristics of Venus. This mission aims to investigate the planet's geological history and the complex chemistry of its thick clouds. By using high-resolution radar and various scientific instruments, researchers hope to understand the processes that led to the extreme greenhouse conditions found on our neighboring planet.

65. (A) EMISAT - Electronic intelligence satellite operated by DRDO
The EMISAT satellite is a specialized spacecraft developed to collect electronic intelligence for defense purposes. It was designed by the primary defense research organization to monitor and analyze signals from enemy radars and communication systems. This capability enhances the national security by providing critical information about the electronic landscape and the location of potential threats along the country's borders.

66. (A) To provide single-window delivery for space-based rural services
Village Resource Centres were established to bring the benefits of space technology directly to rural populations. These centers serve as hubs for providing various services such as tele-education, tele-medicine, and advisories on agriculture and fisheries. By using satellite connectivity, they bridge the information gap in remote areas, empowering local communities with better access to knowledge, healthcare, and governmental resources.

67. (C) Preparing groundwater prospect maps for drilling
During the national drinking water mission, remote sensing was used to identify areas with high potential for finding groundwater. Satellite imagery helps geologists map underground structures and lineaments that indicate the presence of water-bearing aquifers. This information is used to create prospect maps, which guide engineers in selecting the best locations for drilling wells, thereby improving the success rate of water projects.

68. (B) Propulsive landing and reuse of the first stage booster
The ability to return a rocket's first stage to Earth for landing and refurbishment has fundamentally changed the economics of the space industry. This innovation allows the same booster to be used for multiple missions, drastically cutting the cost of each launch. This approach has forced other players in the sector to explore similar reusable technologies to remain competitive in the global market.

69. (C) 2020
The government introduced a major policy shift in 2020 by creating a new regulatory body to open the space sector to private players. This organization was established to promote and authorize space activities by non-governmental entities, ensuring a level playing field. Its creation marked the beginning of a new era where private companies can develop rockets, satellites, and provide space-based services.

70. (C) Creating an indigenous SSA network for debris tracking
Project NETRA is an ambitious initiative focused on enhancing space situational awareness to protect national orbital assets. It involves setting up a network of observational facilities, including radars and telescopes, to track space debris and other potential hazards. By monitoring the environment in which satellites operate, the system can provide early warnings of possible collisions, ensuring the long-term sustainability of space activities.

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71. (A) Statement I only
Telemedicine leverages satellite communication to connect patients in remote locations with specialized doctors in urban centers. Diagnostic tools at the rural node can transmit medical data like heart rates and images in real-time for expert review. This system eliminates the need for patients to travel long distances for initial consultations, significantly improving healthcare access and outcomes in underserved and distant regions.

72. (B) It helps in unearthing under-assessed properties for tax.
Municipalities can use high-resolution imagery to identify buildings and properties that have not been properly declared or assessed for taxation. By comparing satellite data with existing records, local bodies can detect new constructions or extensions and update their tax databases. This application of geospatial technology provides a reliable way to increase municipal revenue and ensure fair assessment across the entire urban area.

73. (D) Joint manned lunar outpost with China
India collaborates with many international partners on various space missions, such as working with the USA on radar satellites and Japan on lunar exploration. However, there are no current or planned joint missions with China to establish a manned lunar outpost. The country's primary focus remains on its own independent lunar missions and collaborations with other established space-faring nations globally.

74. (C) Lunar Transfer Trajectory
Most space debris is found in orbits where human activity is most concentrated, such as Low Earth Orbit and Geostationary Orbit. These regions are filled with spent rocket stages and defunct satellites. In contrast, trajectories used to transfer spacecraft to the moon are far less crowded. Therefore, the risk of collisions with debris is significantly lower in these transit paths compared to Earth's orbits.

75. (A) P-3, Q-2, R-1, S-4
Space technology supports various social welfare initiatives by providing critical connectivity and data. Tele-education brings expert knowledge to remote schools, while tele-medicine links rural patients with specialists. Portals like Bhuvan-Panchayat empower local governance through spatial planning tools. Additionally, Village Resource Centres act as interactive hubs that deliver multiple space-based services directly to communities, enhancing overall rural development and access to information.

76. (B) II only
Satellite data is highly effective for managing water resources in landlocked regions like Madhya Pradesh. It is used to monitor reservoir levels, estimate sedimentation, and manage irrigation areas. However, studying ocean salinity is not a relevant application for an inland state. Remote sensing focuses instead on terrestrial water bodies, soil moisture, and rainfall patterns to support agriculture and local water conservation efforts.

77. (D) NSIL assumed a demand-driven model for operations.
The reforms in the space sector have transformed the commercial arm into a demand-driven organization. This means it now focuses on providing services and products based on the specific requirements of the market and customers. It has also taken on a larger role in owning and operating satellites, as well as managing the commercial production of launch vehicles like the PSLV.

78. (A) Both A and R are true and R is the correct explanation of A.
The Kessler Syndrome describes a dangerous scenario where the volume of space debris in Low Earth Orbit reaches a critical threshold. At this point, collisions between objects become so frequent that they create a self-sustaining cascade of new fragments. This increasing density of debris could eventually make certain orbital paths too hazardous for satellites, potentially hindering future space exploration and satellite-based services.

79. (B) Low Earth Orbit (LEO)
Modern satellite internet projects rely on large constellations of hundreds or thousands of small satellites. These are typically placed in Low Earth Orbit because the proximity to the planet significantly reduces signal latency compared to higher orbits. This allows for high-speed,

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responsive internet services that are comparable to terrestrial networks, making them suitable for real-time applications and global broadband coverage.

80. (D) ISRO and NASA
The NISAR mission is a landmark partnership between the Indian and American space agencies to develop a dual-frequency synthetic aperture radar satellite. This spacecraft will observe Earth's changing ecosystems, ice masses, and natural hazards with unprecedented detail. By combining different radar bands, the mission will provide comprehensive data to help scientists understand complex global processes like climate change and land deformation.

81. (C) Remote terrains where laying fibre is structurally unfeasible
Satellite backhaul is an essential component of the national broadband network, especially in geographically challenging areas. In regions where it is physically or economically difficult to lay optical fiber, such as mountains or dense forests, satellites provide the necessary link to the main network. This ensures that even the most remote villages can access high-speed internet and various digital government services.

82. (A) Direct volumetric measurement of deep aquifers
While satellites are excellent at mapping surface features, they have limitations when it comes to observing deep underground resources. They can easily identify surface water bodies and snow cover, but they cannot directly measure the total volume of water stored in deep aquifers with high precision. Such assessments usually require ground-based surveys and borehole data to complement the broad overview provided by space-borne sensors.

83. (C) 25 years
To prevent the long-term accumulation of space debris, international guidelines suggest that satellites should be removed from the Low Earth Orbit region within twenty-five years of completing their mission. This can be achieved through natural atmospheric drag or by using on-board propulsion to re-enter the atmosphere. Following these rules is essential to ensure that orbits remain safe for future satellite missions.

84. (C) Focusing on advanced R&D and new technologies
The latest national space policy outlines a shift in the primary space agency's focus toward advanced research and development. By transferring operational and commercial tasks to other entities and private players, the agency can concentrate on pioneering new technologies and exploring the deep reaches of space. This strategic change aims to foster a more vibrant and competitive domestic space ecosystem.

85. (C) Both Statement I and Statement II
The Artemis Accords represent an international agreement led by the United States to establish a set of principles for peaceful and sustainable lunar exploration. These accords provide a framework for cooperation among nations as they work toward returning humans to the moon. India formally joined this initiative in 2023, signaling its commitment to collaborative and responsible practices in deep space exploration.

86. (A) Statement I is true, Statement II is false.
Remote sensing is a powerful tool for monitoring urban growth over long periods. By analyzing multi-temporal satellite data, planners can track the expansion of city limits and changes in land use patterns. Additionally, modern high-resolution imagery is capable of detecting unauthorized constructions, allowing municipal authorities to enforce building regulations more effectively and manage urban development in a more systematic manner.

87. (A) Statement I only
The proposal for an independent space station marks a significant step toward establishing a long-term human presence in Low Earth Orbit. This facility will allow for sustained scientific research in microgravity and serve as a platform for testing technologies needed for future interplanetary travel. While the initial modules are being developed, the complete operational station is a long-term goal for the national program.

88. (B) To minimize long-term orbital hazards via rapid atmospheric decay.
During the successful interception of a satellite, the mission was conducted at a relatively low altitude to ensure that any resulting debris would

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re-enter the atmosphere quickly. At this height, atmospheric drag causes the fragments to decay and burn up within a short period, preventing them from becoming long-term hazards to other spacecraft. This approach demonstrates a commitment to maintaining orbital safety.

89. (B) I, II, and IV only
IN-SPACe is tasked with facilitating and regulating the involvement of non-governmental entities in the space sector. Its responsibilities include authorizing private satellite launches and ensuring that these entities have access to the national space agency's technical facilities. It also provides guidance and support to startups, helping them navigate the regulatory landscape and promote innovation within the growing domestic space industry.

90. (A) LEO, MEO, GEO
Earth orbits are categorized based on their altitude above the planet's surface. Low Earth Orbit extends from approximately two hundred up to two thousand kilometers. Beyond this is the Medium Earth Orbit, which reaches up to the altitude of geostationary orbits. Finally, the Geostationary Orbit is located at approximately thirty-six thousand kilometers, where a satellite's orbital period matches the Earth's rotation.

91. (B) It bridges the divide by broadcasting quality educational content.
The dedicated educational satellite has been instrumental in providing quality learning resources to students in remote and tribal areas. It broadcasts interactive lectures and educational content that would otherwise be unavailable in these regions. This satellite-based system helps bridge the digital divide in education, ensuring that students in distant locations have access to the same quality of information as those in cities.

92. (C) Satellite-based interactive broadcasting for rural development
The Jhabua project was a pioneering initiative that demonstrated how satellite communication could support rural development. It utilized interactive broadcasting to deliver information on health, agriculture, and education to remote tribal communities. This project highlighted the potential of space technology to address local challenges and served as a model for subsequent programs aimed at using satellites for social and economic empowerment.

93. (D) High signal latency due to orbital distance
Geostationary satellites are located at a very high altitude, which results in a noticeable delay in signal transmission. This latency is an inherent physical limitation that can affect real-time applications like online gaming or high-frequency financial trading. While these satellites are excellent for providing coverage to large, remote areas, terrestrial fiber optics generally offer much faster response times for interactive digital services.

94. (C) Provide a dedicated satellite network for rural development
The GramSAT program was designed to use satellite technology to support various rural development initiatives. It provides a dedicated network for broadcasting programs related to local governance, agricultural practices, and social welfare directly to village communities. This initiative ensures that vital information reaches the grassroots level, helping to improve the quality of life and empower citizens in remote and rural regions.

95. (A) Deep space asteroid mining
Space technology has many practical applications that benefit rural areas, such as providing telemedicine and education services or monitoring natural disasters. These services use satellites to bridge the gap in infrastructure and information. In contrast, deep space asteroid mining is an advanced industrial concept focused on extracting minerals from distant celestial bodies, which does not directly address immediate rural development needs.

96. (A) 2, 1, 4, 3
A typical telemedicine consultation begins with collecting a patient's vital signs and video at a remote node. This data is then beamed to a communication satellite, which redirects the signal to a ground-based earth station. Finally, the information is downlinked to the specialist hospital hub, allowing doctors to provide a diagnosis. This sequence ensures a seamless flow of information between distant locations.

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97. (A) Bridging the digital divide via rural e-governance and health
Integrating space technology with national digital initiatives plays a vital role in connecting underserved regions. By providing satellite-based internet and communication links, it enables the delivery of e-governance, healthcare, and educational services to remote villages. This approach helps in reducing the digital divide, ensuring that the benefits of the modern digital economy reach all citizens regardless of their geographical location.

98. (C) V only
Establishing a functional telemedicine network requires several technical components, including satellite antennas for connectivity and medical instruments for data collection. A geostationary satellite is used to relay signals between the patient and the hospital hub. However, a cryogenic engine is a propulsion system used only in launch vehicles and is not part of the equipment needed to operate a medical consultation network.

99. (D) Ka-band - Offers higher bandwidth and data rates suitable for broadband
The Ka-band is increasingly used in satellite communications because it offers a much wider bandwidth compared to lower frequency bands. This allows for the transmission of large amounts of data at high speeds, which is essential for modern broadband internet services. While higher frequencies can be affected by heavy rain, advanced technologies are used to maintain signal quality and reliable connectivity.

100. (A) P-3, Q-2, R-1, S-4
The national space agency operates several specialized centers across the country. The Vikram Sarabhai Space Centre in Thiruvananthapuram focuses on launch vehicle development, while the U R Rao Satellite Centre in Bengaluru designs and builds satellites. The Space Applications Centre in Ahmedabad develops payloads, and the National Remote Sensing Centre in Hyderabad manages the acquisition and processing of satellite data.

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CHAPTER 04

Human Body Structure and Organ Systems

1. The axial skeleton of an adult human consists of how many bones?
(A) 126
(B) 80
(C) 206
(D) 64

2. Which of the following statements correctly describes a major metabolic function of the liver?
(A) It produces insulin and glucagon for blood sugar regulation
(B) It serves as the primary site for the absorption of digested carbohydrates
(C) It synthesizes urea from ammonia through the ornithine cycle
(D) It filters metabolic wastes directly from the blood to form urine

3. Identify the incorrect statement regarding the structure of a typical human cell.
(A) The cell membrane is composed of a phospholipid bilayer with embedded proteins
(B) Ribosomes are non-membrane bound organelles found in both cytoplasm and rough endoplasmic reticulum
(C) Lysosomes contain hydrolytic enzymes active at an alkaline pH for cellular digestion
(D) The nucleus houses the genetic material and is surrounded by a double-layered envelope

4. Read the following assertion and reason and select the correct option from the given codes.
Assertion (A): The wall of the left ventricle is significantly thicker than that of the right ventricle.
Reason (R): The left ventricle has to pump blood to all body parts against a higher systemic resistance, whereas the right ventricle pumps blood only to the lungs.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

5. Consider the following statements regarding the types of joints in the human body:
I. Fibrous joints do not allow any movement and are found in the flat skull bones.
II. Cartilaginous joints allow considerable movement and are found between the phalanges.
III. Synovial joints are characterized by the presence of a fluid-filled cavity between the articulating bones.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

6. Which of the following best defines lymph in the human body?
(A) Blood plasma devoid of inorganic salts
(B) Blood minus red blood cells and most large plasma proteins
(C) Pure interstitial fluid containing only dissolved gases
(D) The fluid component of blood without any white blood cells

7. Which of the following best defines the cellular level of organization in the human body?
(A) A collection of various tissue types working together to perform a specific physiological function
(B) The fundamental unit composed of organelles enclosed in a membrane
(C) A group of nearly identical cells that

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perform a common specialized physiological function
(D) The complex interaction of various organ systems to maintain internal body homeostasis

8. Identify the incorrect pair regarding digestive enzymes and their respective substrates.
(A) Salivary amylase - Starch
(B) Lipase - Peptides
(C) Trypsin - Proteins
(D) Nuclease - Nucleic acids

9. Which of the following is an exception and is normally not found in the plasma of a healthy human being?
(A) Fibrinogen
(B) Hemoglobin
(C) Albumin
(D) Globulin

10. What is the most appropriate description of the function of articular cartilage in a human joint?
(A) It secretes synovial fluid to lubricate the joint cavity
(B) It connects muscles to bones to facilitate joint movement
(C) It reduces friction and absorbs shock between the ends of bones
(D) It provides a rigid structural framework for the attachment of ligaments

11. Which specific structures in the human respiratory system are the primary sites for the exchange of gases?
(A) Bronchi
(B) Tracheoles
(C) Bronchioles
(D) Alveoli

12. Match the cell organelles in List I with their primary functions in List II.
List I: (Cell Organelles)
P. Mitochondria
Q. Ribosomes
R. Golgi apparatus
S. Lysosomes
List II: (Primary Functions)
1. Protein synthesis
2. Intracellular digestion
3. ATP generation
4. Packaging and secretion
(A) P-1, Q-3, R-2, S-4
(B) P-3, Q-1, R-2, S-4
(C) P-3, Q-1, R-4, S-2
(D) P-4, Q-2, R-1, S-3

13. Select the correct sequential order of the organs in the human alimentary canal from the following options.
(A) Pharynx, Esophagus, Stomach, Small Intestine, Large Intestine
(B) Pharynx, Stomach, Esophagus, Large Intestine, Small Intestine
(C) Esophagus, Pharynx, Stomach, Small Intestine, Large Intestine
(D) Esophagus, Stomach, Pharynx, Large Intestine, Small Intestine

14. Which muscle type is correctly described as striated and involuntary in nature?
(A) Skeletal muscle
(B) Visceral muscle
(C) Cardiac muscle
(D) Smooth muscle

15. Consider the following statements about blood composition:
Statement I: Erythrocytes are devoid of a nucleus in a mature healthy adult human.
Statement II: Leukocytes are fewer in number compared to erythrocytes but possess a nucleus.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

16. Which cellular organelle is primarily responsible for the synthesis of lipids and detoxification of drugs in human cells?
(A) Smooth endoplasmic reticulum
(B) Rough endoplasmic reticulum
(C) Golgi apparatus complex
(D) Mitochondria organelles

17. What is the physiological effect of a decrease in blood oxygen levels on the kidneys?

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(A) Secrete erythropoietin to increase red blood cell production
(B) Stimulate the juxtaglomerular cells to release renin into the blood
(C) Suppress the reabsorption of sodium ions in the distal tubules
(D) Inhibit the secretion of antidiuretic hormone from the pituitary

18. Which of the following bones is not a part of the human appendicular skeleton?
(A) Sternum
(B) Scapula
(C) Femur
(D) Clavicle

19. The pancreas acts as a heterocrine gland. Which portion is responsible for secreting pancreatic juice containing digestive enzymes?
(A) The clusters of Islets of Langerhans
(B) The endocrine alpha and beta cells
(C) The specialized somatostatin delta cells
(D) The exocrine pancreatic acinar cells

20. Consider the following statements regarding the human digestive system:
Statement I: Bile juice contains digestive enzymes that break down complex fats into fatty acids.
Statement II: Bile juice helps in the emulsification of fats, increasing the surface area for enzyme action.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

21. The spleen is an important organ of the lymphatic system. Which of the following is its primary concept application in the human body?
(A) Act as the primary anatomical site for the maturation of T-lymphocytes
(B) Secrete digestive enzymes required for the chemical breakdown of fats
(C) Filter blood to remove old red cells and hold a blood reserve
(D) Produce new red blood cells continuously during the entire adult life

22. Consider the following pairs of tissue types and their locations in the human body. Which pair is correctly matched?
(A) Ciliated epithelium - Inner lining of blood vessels
(B) Cuboidal epithelium - Lining of kidney tubules
(C) Smooth muscle tissue - Attached to the skeletal bones
(D) Transitional epithelium - Inner lining of the alveoli

23. What is the direct physiological effect of continuous, strenuous muscular activity leading to anaerobic respiration in the muscles?
(A) Overproduction of ATP causing muscle cell hypertrophy
(B) Rapid synthesis of glycogen causing severe muscle stiffness
(C) Depletion of carbon dioxide causing acute muscle cramps
(D) Accumulation of lactic acid causing muscle fatigue

24. Identify the correct statement regarding human blood vessels.
(A) Ensure all arteries carry oxygenated blood to the body without exception
(B) Veins have thick, highly elastic walls to withstand high blood pressure
(C) Ensure all veins carry deoxygenated blood back to the heart chambers
(D) Act as sites for exchange of nutrients and gases at the tissues

25. The primary function of the numerous microscopic projections called microvilli in the small intestine is to:
(A) Secrete large volumes of protective mucus for the intestinal lining
(B) Increase the surface area for the absorption of nutrients
(C) Produce neutralizing bicarbonate ions for acidic gastric chyme
(D) Facilitate the mechanical churning and mixing of food particles

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26. Which of the following tissues is characterized by a liquid extracellular matrix and plays a critical role in transport and defense?
(A) Stratified squamous epithelial tissue
(B) Dense regular connective tissue
(C) Adipose connective tissue
(D) Vascular connective tissue

27. Individuals with which blood group are considered universal recipients?
(A) AB positive
(B) O positive
(C) O negative
(D) AB negative

28. Identify the odd one out among the following types of synovial joints based on their movement mechanisms.
(A) Sutures
(B) Ball and socket joint
(C) Hinge joint
(D) Pivot joint

29. Which structure in the human heart is known as the natural pacemaker?
(A) Atrioventricular (AV) node
(B) Bundle of His
(C) Sinoatrial (SA) node
(D) Purkinje fibers

30. Which enzyme is responsible for the initial digestion of proteins in the highly acidic environment of the stomach?
(A) Trypsin
(B) Amylase
(C) Lipase
(D) Pepsin

31. Which of the following statements correctly identifies the process of urea formation in the human body?
(A) It occurs in the kidneys through the filtration of blood
(B) It takes place in the spleen during the destruction of red blood cells
(C) It occurs in the liver where ammonia combines with carbon dioxide
(D) It is formed in the pancreas during the breakdown of proteins

32. The severe deficiency of dietary iodine directly causes impaired synthesis of hormones from which of the following glands?
(A) Parathyroid gland
(B) Thyroid gland
(C) Pancreas
(D) Adrenal cortex

33. Approximately what percentage of oxygen is transported in a dissolved state through the blood plasma?
(A) 3 percent
(B) 10 percent
(C) 20 percent
(D) 97 percent

34. Consider the following statements regarding the human endocrine system:
I. The pineal gland secretes melatonin which regulates the circadian rhythm.
II. Glucocorticoids are secreted by the adrenal medulla.
III. Progesterone is mainly secreted by the corpus luteum in females.
IV. Erythropoietin is a hormone produced by the heart to increase blood pressure.
V. Hypothyroidism during pregnancy can cause stunted growth in the offspring known as cretinism.
Which of the above statement(s) is/are correct?
(A) I, II, and III
(B) I, III, and V
(C) II, IV, and V
(D) III, IV, and V

35. Identify the correctly matched pair of the human brain part and its primary function.
(A) Medulla oblongata — Control involuntary autonomic functions like respiration
(B) Thalamus — Regulate core body temperature and endocrine functions
(C) Cerebrum — Maintain body posture and complex motor balance
(D) Cerebellum — Act as the center for intelligence and long-term memory

36. Match the human reproductive hormones in List I with their primary roles in List II.
List I: (Hormones)
P. Testosterone
Q. Estrogen

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R. Progesterone
S. Oxytocin
List II: (Primary Roles)
1. Maintains the endometrial lining for pregnancy
2. Stimulates uterine contractions during childbirth
3. Regulates the development of male secondary sexual characteristics
4. Promotes the development of female ovarian follicles and secondary traits
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-1, Q-4, R-3, S-2

37. Identify the incorrect statement regarding the mechanism of inspiration in humans.
(A) The intrapulmonary pressure becomes higher than the atmospheric pressure
(B) It is initiated by the contraction of the diaphragm
(C) The volume of the thoracic chamber increases in the antero-posterior axis
(D) The external intercostal muscles contract to lift the ribs and sternum

38. Identify the odd one out among the following chemical substances found in the human body.
(A) Acetylcholine
(B) Dopamine
(C) Serotonin
(D) Myelin

39. Which of the following statements represents the correct mechanism by which peptide hormones act on target cells?
(A) They enter the cell and bind to intracellular receptors to alter gene expression
(B) Diffuse directly into the nucleus to act as nuclear transcription factors
(C) Integrate into the cell membrane to form specialized ion channel pores
(D) Bind to extracellular receptors and generate second messengers

40. Which of the following substances is negatively affected by abnormal kidney function and appears in urine in conditions like diabetes mellitus?
(A) Urea
(B) Creatinine
(C) Uric acid
(D) Glucose

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41. Consider the following statements regarding the human ear:
Statement I: The organ of Corti is located on the basilar membrane within the cochlea.
Statement II: The semi-circular canals are primarily responsible for the mechanism of hearing.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

42. What is the fundamental structural and functional unit of the human kidney?
(A) Neuron
(B) Alveolus
(C) Nephron
(D) Villus

43. Consider the following components of a reflex arc:
I. Efferent (motor) neuron
II. Receptor
III. Afferent (sensory) neuron
IV. Effector organ
V. Integrating center (CNS)
Which of the following represents the correct sequence of signal transmission during a reflex action?
(A) II, I, V, III, IV
(B) II, III, V, I, IV
(C) III, II, V, I, IV
(D) V, II, III, I, IV

44. What is the direct effect of severe damage to the cerebellum of a human brain?
(A) Complete loss of vision and hearing
(B) Inability to formulate spoken language
(C) Inability to regulate core body temperature
(D) Loss of muscular coordination and balance

45. What is the physiological cause and effect relationship of the sudden surge in Luteinizing Hormone (LH) during the menstrual cycle?
(A) Cause the rapid degeneration of the corpus luteum in the ovary
(B) Significantly thicken the endometrial lining of the uterine wall
(C) Induce the rupture of the follicle and release of the ovum
(D) Inhibit the secretion of Follicle Stimulating Hormone from the gland

46. Match the respiratory volumes in List I with their respective average values in a healthy adult in List II.
List I: (Respiratory Volumes)
P. Tidal Volume (TV)
Q. Inspiratory Reserve Volume (IRV)
R. Expiratory Reserve Volume (ERV)
S. Residual Volume (RV)
List II: (Average Values)
1. 1100 mL to 1200 mL
2. 500 mL
3. 2500 mL to 3000 mL
4. 1000 mL to 1100 mL
(A) P-2, Q-1, R-4, S-3
(B) P-2, Q-3, R-4, S-1
(C) P-4, Q-3, R-2, S-1
(D) P-1, Q-3, R-4, S-2

47. What is the primary physiological function of the parathyroid hormone (PTH) in the human body?
(A) It decreases blood calcium levels by depositing it into bones
(B) It increases blood calcium levels by stimulating bone resorption
(C) Regulate the overall basal metabolic rate of the human body
(D) Stimulate the development of the primary immune system cells

48. Consider the following statements regarding the steps of urine formation:
I. Glomerular filtration is a non-selective process driven by blood pressure.
II. Tubular reabsorption actively and passively transports essential substances back into the blood.
III. Tubular secretion adds substances like hydrogen and potassium ions to the filtrate to maintain ionic balance.
IV. The Loop of Henle is the primary site for the secretion of large blood proteins.
Which of the above statement(s) is/are correct?
(A) I, II, and IV only
(B) I, II, and III only
(C) II, III, and IV only
(D) I, III, and IV only

49. Identify the incorrect pair of the endocrine gland and its secreted hormone.
(A) Thymus - Calcitonin
(B) Testis - Testosterone
(C) Pancreas - Glucagon
(D) Adrenal Medulla - Epinephrine

50. Consider the following statements about the human nervous system:
I. There are 12 pairs of cranial nerves in humans.
II. The somatic nervous system relays impulses from the CNS to smooth muscles.
III. The brain is covered by three meninges: dura mater, arachnoid, and pia mater.
IV. The midbrain, pons, and medulla together form the brain stem.
V. The spinal cord ends at the level of the first cervical vertebra.
Which of the above statement(s) is/are incorrect?
(A) I and III only
(B) III and IV only
(C) II and V only
(D) I, IV, and V only

51. The blind spot in the human eye is characterized by which of the following features?
(A) The region containing a high concentration of cones for sharp vision
(B) The central pit of the macula lutea responsible for color perception
(C) The heavily pigmented layer that prevents internal reflection of light
(D) The area where the optic nerve leaves and lacks photoreceptors

52. Consider the following statements regarding the nephron:
Statement I: The glomerulus is a tuft of capillaries formed by the afferent arteriole.
Statement II: Blood from the glomerulus is carried away by the efferent arteriole.

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Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

53. What is the most appropriate description of the function of the sympathetic nervous system?
(A) It conserves body energy and promotes rest and digest functions
(B) Regulate conscious, voluntary muscle movements and motor responses
(C) Prepare the body for fight or flight responses during stress
(D) Exclusively control and interpret sensory inputs from peripheral organs

54. In the concept of blood glucose homeostasis, which two hormones play antagonistic (opposing) roles?
(A) Thyroxine and Calcitonin
(B) Epinephrine and Norepinephrine
(C) Insulin and Glucagon
(D) Aldosterone and Antidiuretic Hormone

55. Which endocrine gland is traditionally referred to as the "master gland" due to its role in regulating other endocrine glands?
(A) Pituitary gland
(B) Thyroid gland
(C) Adrenal gland
(D) Pineal gland

56. Identify the odd one out among the following parts of the human respiratory system.
(A) Esophagus
(B) Trachea
(C) Larynx
(D) Pharynx

57. Identify the correct pair regarding the human female reproductive system.
(A) Fallopian tube - Site of fertilization
(B) Uterus - Site of estrogen synthesis
(C) Ovary - Site of embryo implantation
(D) Cervix - Site of gametogenesis

58. The two hemispheres of the human cerebrum are connected by a tract of nerve fibers known as the:
(A) Corpus callosum
(B) Cerebellar peduncle
(C) Medulla oblongata
(D) Pons varolii

59. Which of the following hormones is not synthesized and secreted by the anterior pituitary gland?
(A) Growth Hormone (GH)
(B) Prolactin (PRL)
(C) Oxytocin
(D) Thyroid Stimulating Hormone (TSH)

60. The structural and functional pathway formed by a sensory neuron, an interneuron, and a motor neuron that mediates an immediate involuntary response is defined as:
(A) Nerve tract
(B) Reflex arc
(C) Synaptic cleft
(D) Action potential

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61. Which of the following is not considered a primary lymphoid organ in the human immune system?
(A) Bone marrow
(B) Thymus
(C) Spleen
(D) None of the above (all are primary lymphoid organs)

62. In terms of human anatomy, which term refers to a structure situated closer to the trunk or point of attachment?
(A) Distal
(B) Proximal
(C) Lateral
(D) Medial

63. Identify the odd one out among the following bones found in the human ear.
(A) Hyoid
(B) Malleus
(C) Incus
(D) Stapes

64. Which of the following is an exception and does not serve as a primary organ involved in maintaining fluid homeostasis?
(A) Kidneys
(B) Skin
(C) Appendix
(D) Lungs

65. Consider the following statements regarding homeostasis in humans:
I. Sweating and vasodilation of skin blood vessels help lower body temperature during heat exposure.
II. Shivering generates heat through involuntary muscle contractions when core temperature drops.
III. The medulla oblongata is the primary brain center that monitors and sets the human body temperature.
Which of the above statement(s) is/are incorrect?
(A) III only
(B) I only
(C) II only
(D) I and II only

66. Match the common diseases linked to organ system failures in List I with the corresponding affected organs in List II.
List I: (Diseases)
P. Glaucoma
Q. Angina Pectoris
R. Jaundice
S. Uremia
List II: (Affected Organs)
1. Heart
2. Liver
3. Kidneys
4. Eyes
(A) P-4, Q-1, R-2, S-3
(B) P-1, Q-4, R-3, S-2
(C) P-4, Q-2, R-1, S-3
(D) P-3, Q-1, R-2, S-4

67. Identify the incorrect statement regarding the human skin.
(A) The epidermis is the outermost, non-vascular layer composed of stratified squamous epithelium
(B) The dermis contains blood vessels, nerve endings, hair follicles, and sweat glands
(C) Sebaceous glands exclusively secrete sweat to regulate body temperature
(D) Subcutaneous tissue (hypodermis) mainly consists of adipose tissue acting as an insulator

68. Synovial fluid is a specialized body fluid. Where is it primarily found, and what is its main function?
(A) In the brain ventricles, acting as a structural shock absorber
(B) In joint cavities, providing lubrication to cartilage
(C) In the digestive tract, facilitating the steady movement of chyme
(D) Surrounding the lungs, preventing friction during deep breathing cycles

69. What is the definition of homeostasis as it applies to human physiology?
(A) The maintenance of a relatively stable internal environment despite external fluctuations
(B) The process by which the body continuously changes its internal temperature to match the environment
(C) The cessation of metabolic activities during periods of extreme stress
(D) The mechanism of programmed cell death to eliminate old cells

70. Which vitamin plays a crucial role in the synthesis of prothrombin and other blood clotting factors in the liver?
(A) Vitamin A
(B) Vitamin C
(C) Vitamin K
(D) Vitamin E

71. The age-related involuntary loss of skeletal muscle mass and strength in humans is scientifically termed:
(A) Sarcopenia
(B) Osteopenia
(C) Muscular dystrophy
(D) Myasthenia gravis

72. Read the following assertion and reason and select the correct option from the given codes.
Assertion (A): Vaccination provides a long-lasting immunity against specific infectious diseases.

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Reason (R): Vaccines generate memory B and T cells that recognize and mount a rapid response upon subsequent exposure to the same pathogen.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

73. Match the essential vitamins and elements in List I with their primary roles in human physiology in List II.
List I: (Elements/Vitamins)
P. Iron
Q. Calcium
R. Vitamin B12
S. Vitamin D
List II: (Primary Roles)
1. Intestinal absorption of calcium
2. Formation of hemoglobin
3. Muscle contraction and blood clotting
4. Maturation of red blood cells
(A) P-3, Q-2, R-1, S-4
(B) P-2, Q-4, R-3, S-1
(C) P-4, Q-1, R-2, S-3
(D) P-2, Q-3, R-4, S-1

74. Identify the incorrect pair of a common physiological disease and the primary organ system it affects.
(A) Asthma - Respiratory System
(B) Myocardial Infarction - Circulatory System
(C) Cirrhosis - Excretory System (Kidneys)
(D) Rheumatoid Arthritis - Skeletal System (Joints)

75. Consider the following statements regarding the effect of aging on the human body:
Statement I: Aging is associated with a decrease in bone density, leading to a higher risk of osteoporosis.
Statement II: The elasticity of blood vessels generally increases with age, leading to lower blood pressure.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

76. The biological concept of varied skin pigmentation among human populations is primarily determined by the concentration of which pigment?
(A) Carotene
(B) Hemoglobin
(C) Bilirubin
(D) Melanin

77. Which of the following is the most appropriate description of a lifestyle factor contributing to chronic kidney disease?
(A) Regular engagement in intense cardiovascular exercise routines
(B) Diets that are consistently high in supplemental vitamin C levels
(C) Maintaining adequate daily water intake for systemic hydration
(D) Uncontrolled hypertension and high blood sugar levels

78. Consider the following statements about immunity and antibodies:
I. Antibodies are protein molecules called immunoglobulins.
II. Each antibody molecule has four peptide chains: two light and two heavy.
III. Cell-mediated immunity is mediated by B-lymphocytes.
IV. T-lymphocytes themselves do not secrete antibodies but help B-lymphocytes produce them.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I, III, and IV only
(D) I, II, and IV only

79. The conversion of inactive prothrombin to active thrombin during coagulation requires which specific enzyme complex?
(A) Kinase
(B) Thrombokinase
(C) Peptidase
(D) Amylase

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80. Consider the following statements regarding the effect of aging on the human body:
Statement I: The maximum heart rate achievable during exercise generally decreases with age.
Statement II: The speed of nerve impulse conduction typically increases with advancing age.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

81. What is the primary cause and effect relationship associated with presbyopia in aging human individuals?
(A) Hardening of the tympanic membrane causing significant hearing loss
(B) Degeneration of olfactory nerve endings causing complete loss of smell
(C) Loss of lens elasticity causing difficulty in near focusing
(D) Clouding of the cornea leading to total blindness in both eyes

82. Identify the correct statement differentiating innate immunity from acquired immunity.
(A) Innate immunity is present from birth; acquired develops later
(B) Innate immunity is highly specific, while acquired is non-specific in nature
(C) Innate immunity involves memory cells, whereas acquired immunity relies on physical barriers
(D) Acquired immunity serves as the body's first line of defense against pathogens

83. What is the most appropriate description of a negative feedback mechanism in human homeostasis?
(A) A process that amplifies a biological response until a specific goal is met
(B) The suppression of an organ's function due to a toxic metabolic buildup
(C) The uncontrolled division of cells leading to a localized or systemic disease
(D) A mechanism where the output reduces the original stimulus

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84. Identify the correct statement regarding the physiological role of the hypothalamus.
(A) It controls the release of hormones from the posterior pituitary but has no connection with the anterior pituitary
(B) It functions as the primary center for integrating visual sensory inputs
(C) It plays a crucial role in osmoregulation, thirst, and body temperature homeostasis
(D) It is responsible for the direct production of antibodies during an infection

85. The process of blood clotting starts with the release of which specific factor from injured tissues and activated platelets?
(A) Plasminogen
(B) Immunoglobulin
(C) Thromboplastin
(D) Serum albumin

86. Which of the following statements best defines active immunity?
(A) The passive transfer of pre-formed antibodies to a healthy person
(B) Immunity developed by the body upon exposure to an antigen
(C) Immunity naturally transferred from a mother to her breastfeeding infant
(D) The immediate protection provided by the therapeutic injection of antivenom

87. Which common respiratory disorder is most directly linked to the lifestyle habit of chronic cigarette smoking?
(A) Pneumonia
(B) Emphysema
(C) Tuberculosis
(D) Diphtheria

88. Identify the correct pair of the substance and its role in the blood clotting mechanism.
(A) Fibrinogen - An active enzyme that breaks down blood clots
(B) Thrombin - Converts soluble fibrinogen into insoluble fibrin threads
(C) Heparin - Promotes the rapid coagulation of blood
(D) Calcium ions - Inhibits the activation of clotting factors

89. Which genetic disorder is characterized by the absence of one or more blood clotting factors, resulting in prolonged bleeding?
(A) Anemia
(B) Hemophilia
(C) Leukemia
(D) Polycythemia

90. Atherosclerosis is a lifestyle-linked disease that severely impacts human organ health. Which process fundamentally drives this condition?
(A) The deposition of calcium and cholesterol plaques in the inner walls of arteries
(B) The abnormal thickening of the alveolar walls leading to impaired gas exchange
(C) The progressive loss of myelin sheath around peripheral neurons
(D) The destruction of pancreatic beta cells due to an autoimmune response

91. Consider the following statements regarding the return of lymphatic fluid to the circulatory system:
Statement I: Lymphatics from the lower body and the left side of the upper body drain into the thoracic duct.
Statement II: The thoracic duct eventually empties its lymph into the left subclavian vein.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

92. In a healthy adult human, which compartment holds the largest percentage of total body water?
(A) Blood plasma
(B) Interstitial fluid
(C) Intracellular fluid
(D) Lymphatic fluid

93. The shortening of which specific chromosomal structures is strongly linked to cellular aging and the limit of cell divisions?
(A) Centromeres
(B) Chromatids
(C) Histones
(D) Telomeres

94. Given the following levels of biological organization:
I. Organism
II. Organ System
III. Cell
IV. Tissue
V. Organ
What is the correct structural sequence from the simplest level to the most complex?
(A) III, IV, II, V, I
(B) IV, III, V, II, I
(C) III, IV, V, II, I
(D) IV, V, III, II, I

95. Which of the following represents the correct sequence of blood flow through the human heart, starting from the systemic circulation returning deoxygenated blood?
(A) Right Atrium, Right Ventricle, Pulmonary Artery, Lungs, Pulmonary Vein, Left Atrium, Left Ventricle, Aorta
(B) Right Ventricle, Right Atrium, Pulmonary Vein, Lungs, Pulmonary Artery, Left Ventricle, Left Atrium, Aorta
(C) Left Atrium, Left Ventricle, Pulmonary Artery, Lungs, Pulmonary Vein, Right Atrium, Right Ventricle, Aorta
(D) Right Atrium, Left Atrium, Pulmonary Artery, Lungs, Pulmonary Vein, Right Ventricle, Left Ventricle, Aorta

96. Identify the incorrect pair concerning the general effects of biological aging on human body systems.
(A) Immune System - Reduced response to vaccines and higher susceptibility to infections
(B) Digestive System - Significant increase in the secretion of gastric juices and metabolism
(C) Nervous System - Decrease in the number of neurons and brain volume
(D) Cardiovascular System - Stiffening of blood vessels leading to increased cardiac workload

97. Which of the following is an exception and does not act as an extracellular fluid (ECF) in the human body?
(A) Nucleoplasm

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(B) Aqueous humor
(C) Interstitial fluid
(D) Cerebrospinal fluid

98. What is the most appropriate term for the process by which the human body tightly regulates the osmotic pressure of its body fluids?
(A) Thermoregulation
(B) Osmoregulation
(C) Hemodynamics
(D) Chemiosmosis

99. Identify the odd one out among the following body fluids based on their primary compartment classification.
(A) Cerebrospinal fluid
(B) Synovial fluid
(C) Blood plasma
(D) Cytosol

100. Approximately what percentage of an average healthy adult human's body weight is composed of water?
(A) 20 to 30 percent
(B) 40 to 50 percent
(C) 50 to 65 percent
(D) 80 to 90 percent

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ANSWERS

1. (B) 80
The axial skeleton serves as the central framework of the adult human body. It is composed of the skull, vertebral column, ribs, and sternum. These structures collectively protect vital organs like the brain, spinal cord, and heart. In a mature adult, this central division consists of exactly eighty bones, providing support and stability for the entire physique.

2. (C) It synthesizes urea from ammonia through the ornithine cycle
The liver performs critical metabolic roles, including the detoxification of nitrogenous wastes. It facilitates the ornithine cycle, where toxic ammonia produced during protein metabolism is converted into urea. This water-soluble compound is then transported through the bloodstream to the kidneys for excretion. This process is vital for maintaining safe nitrogen levels and preventing systemic toxicity within the body.

3. (C) Lysosomes contain hydrolytic enzymes active at an alkaline pH for cellular digestion
Lysosomes are membrane-bound organelles containing diverse hydrolytic enzymes used for intracellular digestion and waste removal. These enzymes are characterized by their optimal activity at an acidic pH, typically around five, rather than an alkaline environment. Maintaining this internal acidity is crucial for the efficient breakdown of macromolecules, damaged organelles, and foreign substances captured by the cell during phagocytosis.

4. (A) Both A and R are true and R is the correct explanation of A.
The left ventricle possesses a significantly thicker muscular wall compared to the right ventricle. This structural difference is a functional adaptation to the cardiovascular system requirements. While the right side pumps deoxygenated blood only to the nearby lungs, the left side must generate enough pressure to drive oxygenated blood through the entire systemic circulation against high vascular resistance.

5. (B) I and III only
Fibrous joints are immovably fixed and lack a joint cavity, typically connecting bones with dense connective tissue like those in the skull. Synovial joints are highly mobile and characterized by a fluid-filled cavity between articulating surfaces. Conversely, cartilaginous joints allow only limited movement, such as between vertebrae, whereas phalanges possess synovial hinge joints allowing for considerable motion.

6. (B) Blood minus red blood cells and most large plasma proteins
Lymph is a clear, straw-colored fluid that circulates through the lymphatic system. It is derived from interstitial fluid that enters lymphatic capillaries. Compositionally, it resembles blood plasma but is distinguished by the absence of red blood cells and most large plasma proteins. It contains specialized white blood cells and serves essential roles in fluid balance and immune surveillance.

7. (B) The fundamental unit composed of organelles enclosed in a membrane
The cellular level represents the basic structural and functional unit of life within the biological hierarchy. Cells are complex entities containing various specialized organelles, such as the nucleus and mitochondria, enclosed within a protective membrane. At this stage, all essential biochemical processes occur to sustain life. Multiple cells of the same type then aggregate to form tissues for specialized functions.

8. (B) Lipase - Peptides
Digestive enzymes exhibit high specificity for their respective substrates to ensure efficient nutrient breakdown. Salivary amylase targets starch, trypsin acts on proteins, and nucleases degrade nucleic acids. However, lipase is specifically designed to catalyze the hydrolysis of lipids or fats into fatty acids and glycerol. Peptides are actually the substrates for peptidases, which further break them down into individual amino acids.

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9. (B) Hemoglobin
Human blood plasma is a pale yellow liquid component of blood that holds various proteins and solutes in suspension. Essential plasma proteins include fibrinogen for clotting, albumin for osmotic balance, and globulins for immunity. Hemoglobin is a specialized iron-containing protein responsible for oxygen transport. It is strictly localized within red blood cells and is not found freely in healthy plasma.

10. (C) It reduces friction and absorbs shock between the ends of bones
Articular cartilage is a smooth, white tissue that covers the ends of bones where they come together to form joints. Its primary physiological role is to provide a low-friction surface that allows for smooth gliding during movement. Additionally, it acts as a resilient cushion that absorbs mechanical shocks and distributes loads across the joint surfaces, protecting the underlying bone.

11. (D) Alveoli
The human respiratory system facilitates gas exchange through a series of branching tubes leading to the terminal functional units. While the bronchi and bronchioles act as conducting passages, the actual exchange of oxygen and carbon dioxide occurs across the thin membranes of the alveoli. These microscopic air sacs provide a massive surface area and are surrounded by a dense network of capillaries.

12. (C) P-3, Q-1, R-4, S-2
Cell organelles perform specialized tasks essential for cellular survival and function. Mitochondria are the powerhouses responsible for generating ATP through aerobic respiration. Ribosomes are the sites for protein synthesis. The Golgi apparatus modifies, packages, and secretes various biomolecules. Lysosomes contain digestive enzymes for intracellular breakdown. Together, these components ensure the cell maintains its structural integrity and meets its diverse metabolic demands.

13. (A) Pharynx, Esophagus, Stomach, Small Intestine, Large Intestine
The human alimentary canal is a continuous muscular tube extending from the mouth to the anus. After food is swallowed, it passes through the pharynx and then into the esophagus. From there, it enters the stomach for chemical and mechanical digestion. The journey continues through the small intestine, where most absorption occurs, and finally moves into the large intestine for waste processing.

14. (C) Cardiac muscle
Muscle tissues are classified based on their appearance and control mechanisms. Skeletal muscles are striated and under voluntary control, while smooth muscles are non-striated and involuntary. Cardiac muscle represents a unique hybrid, as it displays a striated pattern under a microscope but functions involuntarily. Found only in the heart, it is designed for continuous, rhythmic contractions to pump blood throughout the body.

15. (A) Both Statement I and Statement II are correct
Human blood contains diverse cellular elements with distinct structural features. Mature erythrocytes, or red blood cells, lack a nucleus to maximize the space available for hemoglobin and oxygen transport. In contrast, leukocytes, or white blood cells, are nucleated and play vital roles in the immune response. Although leukocytes are significantly less numerous than erythrocytes, their presence is essential for defense.

16. (A) Smooth endoplasmic reticulum
The smooth endoplasmic reticulum is a versatile organelle characterized by the absence of ribosomes on its surface. Its primary metabolic functions include the synthesis of various lipids, such as phospholipids and cholesterol, and the production of steroid hormones. Additionally, it plays a critical role in the liver by facilitating the detoxification of drugs, alcohol, and other potentially harmful metabolic byproducts.

17. (A) Secrete erythropoietin to increase red blood cell production
When the kidneys detect a decrease in blood oxygen levels, they respond by secreting a hormone called erythropoietin. This chemical signal travels to the bone marrow, where it stimulates the production of more red blood cells. By increasing the total count of erythrocytes, the body enhances its oxygen-carrying capacity, thereby restoring normal oxygen delivery to tissues and maintaining metabolic homeostasis.

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18. (A) Sternum
The human skeleton is divided into two main sections: the axial and appendicular skeletons. The appendicular skeleton includes the bones of the upper and lower limbs, along with the pectoral and pelvic girdles that attach them to the body. This includes the scapula, clavicle, and femur. The sternum, however, is a central bone of the chest and belongs to the axial skeleton.

19. (D) The exocrine pancreatic acinar cells
The pancreas is a dual-function gland exhibiting both endocrine and exocrine properties. Its endocrine portion consists of the Islets of Langerhans, which secrete hormones like insulin. The larger exocrine component is composed of acinar cells. These specialized cells synthesize and secrete pancreatic juice, which contains vital digestive enzymes that break down proteins, carbohydrates, and fats within the lumen of the small intestine.

20. (D) Statement I is incorrect but Statement II is correct
Bile juice is a yellowish-green fluid produced by the liver and stored in the gallbladder. Unlike most digestive fluids, it does not contain any enzymes for the chemical breakdown of nutrients. Instead, its primary function is the emulsification of large fat globules into smaller droplets. This physical process significantly increases the surface area for lipase enzymes to act upon, facilitating efficient digestion.

21. (C) Filter blood to remove old red cells and hold a blood reserve
The spleen is the largest organ in the lymphatic system and is situated in the upper left quadrant of the abdomen. It functions as a sophisticated blood filter, identifying and removing aged, damaged, or abnormal red blood cells from circulation. Additionally, the spleen serves as a significant reservoir for blood and plays a key role in the immune system by housing lymphocytes.

22. (B) Cuboidal epithelium - Lining of kidney tubules
Epithelial tissues are classified by shape and layers to suit their specific locations. Ciliated epithelium typically lines the respiratory tract or fallopian tubes, while blood vessels are lined by simple squamous epithelium. Cuboidal epithelium is found in the lining of kidney tubules, where it facilitates secretion and absorption. Transitional epithelium is unique to the urinary bladder, allowing for significant stretching.

23. (D) Accumulation of lactic acid causing muscle fatigue
During intense and prolonged physical activity, the oxygen supply to muscles may become insufficient to meet metabolic demands. Consequently, muscle cells switch from aerobic to anaerobic respiration to produce energy. This metabolic pathway results in the accumulation of lactic acid within the muscle tissues. The presence of this byproduct lowers cellular pH and leads to the sensation of muscle fatigue and soreness.

24. (D) Act as sites for exchange of nutrients and gases at the tissues
Human blood vessels form a complex network for transport. While most arteries carry oxygenated blood, the pulmonary artery is an exception. Similarly, the pulmonary vein carries oxygenated blood, unlike most veins. Veins generally have thinner walls compared to arteries. Capillaries, which connect the two, have extremely thin walls that facilitate the direct exchange of nutrients, gases, and wastes between blood and tissues.

25. (B) Increase the surface area for the absorption of nutrients
Microvilli are tiny, finger-like projections found on the apical surface of epithelial cells lining the small intestine. Collectively, they form the brush border and significantly expand the total surface area available for nutrient absorption. This structural modification ensures that the maximum amount of digested products, such as glucose and amino acids, can be efficiently transported into the bloodstream to support bodily functions.

26. (D) Vascular connective tissue
Vascular connective tissue, primarily blood, is unique due to its liquid extracellular matrix known as plasma. This fluid medium allows for the continuous transport of oxygen, nutrients, hormones, and waste products throughout the body. Furthermore, it contains specialized cells like leukocytes that provide essential defense against pathogens. This combination of transport

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and protection makes it critical for maintaining homeostasis across all organ systems.

27. (A) AB positive
Individuals with the AB positive blood group are designated as universal recipients. This classification arises because their blood plasma lacks both anti-A and anti-B antibodies, and their red blood cells express the Rh factor. Consequently, they can safely receive transfusions from any other blood type without triggering a life-threatening immune response. This versatility is a critical factor in emergency medical blood management.

28. (A) Sutures
Synovial joints are characterized by a fluid-filled cavity and allow for varying degrees of free movement. Examples include ball and socket, hinge, and pivot joints, each facilitating different mechanical motions. In contrast, sutures are a type of fibrous joint found exclusively between the flat bones of the skull. These joints are immovably fixed and lack the mobility characteristic of the synovial group.

29. (C) Sinoatrial (SA) node
The sinoatrial node is a specialized cluster of cells located in the right atrium of the human heart. It is widely recognized as the natural pacemaker because it possesses the highest rate of spontaneous depolarization. By generating electrical impulses that trigger rhythmic contractions, it establishes the fundamental heart rate. This signal then propagates through the conduction system to ensure efficient blood pumping.

30. (D) Pepsin
The stomach provides a highly acidic environment, primarily due to the secretion of hydrochloric acid. In this setting, the inactive proenzyme pepsinogen is converted into the active proteolytic enzyme pepsin. Pepsin is specifically adapted to function at a low pH, where it initiates the chemical digestion of proteins by breaking them down into smaller fragments known as peptides and peptones.

31. (C) It occurs in the liver where ammonia combines with carbon dioxide
Urea is the primary nitrogenous waste product in humans, synthesized to safely eliminate excess nitrogen. This biochemical process occurs exclusively in the liver through a series of reactions known as the urea cycle. During this cycle, toxic ammonia derived from amino acid metabolism is combined with carbon dioxide. The resulting urea is then released into the blood and subsequently filtered by kidneys.

32. (B) Thyroid gland
Iodine is an essential trace element required for the synthesis of thyroxine and triiodothyronine. These hormones are produced by the thyroid gland and are vital for regulating the body's metabolism, growth, and development. A severe deficiency in dietary iodine intake leads to impaired hormone production, which can result in conditions such as goiter or hypothyroidism, significantly impacting overall physiological health.

33. (A) 3 percent
Oxygen transport in the blood occurs via two primary methods. The vast majority, approximately ninety-seven percent, is carried by binding to hemoglobin within red blood cells. The remaining small fraction, which is about three percent, travels in a dissolved state within the blood plasma. This dissolved portion is critical as it establishes the partial pressure gradient necessary for oxygen diffusion into tissues.

34. (B) I, III, and V
The endocrine system utilizes various glands to regulate physiology. The pineal gland manages sleep cycles via melatonin, and the corpus luteum produces progesterone during pregnancy. Hypothyroidism in expectant mothers can lead to cretinism in infants. However, glucocorticoids are secreted by the adrenal cortex, not the medulla, and erythropoietin is primarily a renal hormone that stimulates red blood cell production.

35. (A) Medulla oblongata — Control involuntary autonomic functions like respiration
The human brain consists of several specialized regions, each governing distinct physiological tasks. The medulla oblongata is a vital component of the brain stem responsible for controlling

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involuntary autonomic functions, such as breathing, heart rate, and blood pressure. While the cerebrum handles higher-level thinking and the cerebellum manages balance, the hypothalamus is the primary regulator of core body temperature and thirst.

36. (A) P-3, Q-4, R-1, S-2
Reproductive hormones play specialized roles in human biology. Testosterone regulates male secondary sexual characteristics and sperm production. Estrogen promotes female traits and follicle development. Progesterone is essential for maintaining the endometrial lining during pregnancy. Oxytocin is a critical hormone that stimulates uterine contractions during labor and facilitates milk ejection. These hormones work in coordination to ensure successful reproduction and development.

37. (A) The intrapulmonary pressure becomes higher than the atmospheric pressure
Inspiration is an active process that draws air into the lungs. It begins with the contraction of the diaphragm and external intercostal muscles, which increases thoracic volume. According to Boyle's law, this expansion causes the intrapulmonary pressure to drop below the atmospheric pressure. This pressure gradient forces external air into the respiratory tract. Therefore, pressure must be lower, not higher, for inspiration.

38. (D) Myelin
Acetylcholine, dopamine, and serotonin are all categorized as neurotransmitters. These chemical substances facilitate the transmission of nerve impulses across synapses between neurons. Myelin, however, is a different type of substance. It is a fatty insulation layer produced by specialized cells that wraps around the axons of certain neurons. Myelin functions to increase the speed of impulse conduction rather than acting as a messenger.

39. (D) Bind to extracellular receptors and generate second messengers
Peptide hormones are generally water-soluble and cannot cross the lipid-rich cell membrane. Instead, they act by binding to specific receptors located on the surface of target cells. This binding event triggers the activation of internal signaling pathways, often involving second messengers like cyclic AMP. These messengers then propagate the signal to elicit the desired physiological response within the cell without the hormone entering.

40. (D) Glucose
In a healthy individual, the kidneys efficiently reabsorb all filtered glucose back into the bloodstream through the proximal tubules. However, in conditions like diabetes mellitus, blood sugar levels exceed the renal threshold for reabsorption. Consequently, the excess glucose remains in the filtrate and is excreted in the urine. This condition, known as glycosuria, is a hallmark diagnostic indicator of abnormal glucose metabolism.

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41. (C) Statement I is correct but Statement II is incorrect
The human ear is divided into structures for hearing and balance. The organ of Corti, located on the basilar membrane within the cochlea, contains hair cells that convert sound vibrations into nerve impulses. Conversely, the semi-circular canals and the vestibule are primarily responsible for maintaining equilibrium and spatial orientation. Therefore, they do not serve as the primary mechanisms for the process of hearing.

42. (C) Nephron
The nephron is the microscopic structural and functional unit of the human kidney. Each kidney contains approximately one million nephrons, which are responsible for filtering blood, reabsorbing essential nutrients and water, and secreting wastes. This complex process ultimately leads to the formation of urine. By performing these tasks, nephrons play a central role in maintaining fluid balance, electrolyte levels, and systemic homeostasis.

43. (B) II, III, V, I, IV
A reflex arc is a neural pathway that mediates an automatic response to a stimulus. The sequence begins when a receptor detects a stimulus and generates a signal. This impulse is carried by an afferent sensory neuron to the integrating center in the central nervous system. After processing, an efferent motor neuron transmits the response signal to an effector organ, resulting in action.

44. (D) Loss of muscular coordination and balance
The cerebellum is a significant region of the hindbrain situated at the base of the skull. Its primary function is the refinement of motor activities and the maintenance of posture and equilibrium. Severe damage to this area typically results in ataxia, which is characterized by a profound loss of muscular coordination, unsteady gait, and the inability to maintain physical balance during movement.

45. (C) Induce the rupture of the follicle and release of the ovum
During the middle of the menstrual cycle, the pituitary gland releases a sudden, massive surge of Luteinizing Hormone. This hormonal spike is the critical trigger that causes the most mature Graafian follicle in the ovary to rupture. This process, known as ovulation, results in the release of the secondary oocyte into the fallopian tube, where it becomes available for potential fertilization.

46. (B) P-2, Q-3, R-4, S-1
Respiratory volumes represent the amount of air moved during various breathing phases. Tidal volume is the standard amount exchanged during relaxed breathing, averaging 500 mL. Inspiratory reserve volume is the extra air inhaled forcibly, ranging from 2500 to 3000 mL. Expiratory reserve volume is the extra air exhaled, typically 1000 to 1100 mL. Residual volume is the air remaining after maximum exhalation.

47. (B) It increases blood calcium levels by stimulating bone resorption
Parathyroid hormone is secreted by the parathyroid glands in response to low systemic calcium levels. Its primary function is to increase the concentration of calcium in the blood. It achieves this by stimulating bone resorption, which releases stored calcium into the circulation. Additionally, it enhances calcium reabsorption in the kidneys and promotes the activation of vitamin D to increase intestinal calcium absorption.

48. (B) I, II, and III only
Urine formation involves three distinct physiological stages. Glomerular filtration is a non-selective process driven by hydrostatic pressure that pushes plasma through the filter. Tubular reabsorption then retrieves essential nutrients and water from the filtrate back into the blood. Concurrently, tubular secretion adds specific ions and wastes to the urine. The Loop of Henle primarily functions in water conservation rather than protein secretion.

49. (A) Thymus - Calcitonin
Endocrine glands secrete specific hormones to regulate various bodily functions. The testes produce testosterone, the pancreas releases glucagon, and the adrenal medulla secretes epinephrine. However, calcitonin is produced by the parafollicular cells of the thyroid gland, not the thymus. The thymus gland is primarily responsible for secreting thymosins, which play a crucial role in the maturation of the immune system's T-lymphocytes.

50. (C) II and V only
The human nervous system has many specific anatomical features. There are twelve pairs of cranial nerves and the brain is protected by three meningeal layers. The brain stem includes the midbrain, pons, and medulla. However, the somatic nervous system controls skeletal muscles, not smooth muscles. Furthermore, the spinal cord typically terminates near the first or second lumbar vertebra rather than the cervical.

51. (D) The area where the optic nerve leaves and lacks photoreceptors
The blind spot is a specific region on the retina where the axons of ganglion cells converge to form the optic nerve. This anatomical exit point is entirely devoid of photoreceptor cells, meaning it contains neither rods nor cones. Consequently, any light that falls on this particular area cannot be converted into neural signals, resulting in a lack of visual perception.

52. (A) Both Statement I and Statement II are correct
The nephron is the functional unit of the kidney, beginning with the renal corpuscle. This structure contains the glomerulus, which is a specialized network of capillaries derived from the afferent arteriole. High-pressure blood filtration occurs here. Following filtration, the remaining blood is collected and carried away from the glomerular capsule by the efferent arteriole, which then forms the peritubular capillary network.

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53. (C) Prepare the body for fight or flight responses during stress
The sympathetic nervous system is a division of the autonomic nervous system that becomes highly active during stressful or emergency situations. Its primary role is to prepare the body for the fight or flight response. This involves increasing the heart rate, dilating the pupils, and diverting blood flow toward skeletal muscles. These physiological changes enhance the body's ability to react to threats.

54. (C) Insulin and Glucagon
Insulin and glucagon are two hormones produced by the pancreas that work in opposition to maintain blood glucose homeostasis. Insulin is released when blood sugar levels are high, promoting the uptake and storage of glucose by cells. Conversely, glucagon is secreted when levels are low, stimulating the liver to release stored glucose into the bloodstream. This antagonistic relationship ensures stable energy levels.

55. (A) Pituitary gland
The pituitary gland is historically called the master gland because it produces several trophic hormones that regulate the activity of other endocrine organs. Situated at the base of the brain, it controls the thyroid, adrenal glands, and gonads. While it is itself regulated by the hypothalamus, its broad influence over growth, metabolism, and reproduction makes it a central hub for endocrine coordination.

56. (A) Esophagus
The human respiratory system includes structures specialized for the passage of air and gas exchange. The pharynx, larynx, and trachea serve as conducting airways that guide air into the lungs. In contrast, the esophagus is a muscular tube belonging to the digestive system. Its primary function is the transport of food and liquids from the pharynx down to the stomach via peristalsis.

57. (A) Fallopian tube - Site of fertilization
The female reproductive system consists of several organs with specialized functions. The ovaries are the sites for gametogenesis and the production of hormones like estrogen. The uterus is the anatomical location where embryo implantation and fetal development occur. The fallopian tubes, however, are the specific structures where the sperm typically meets the ovum, making them the primary site for successful fertilization.

58. (A) Corpus callosum
The human cerebrum is divided into two distinct lateral halves known as cerebral hemispheres. These hemispheres are integrated and communicate through a thick, C-shaped band of white matter fibers called the corpus callosum. This bridge consists of millions of axons that facilitate the rapid exchange of information and coordinated processing between the left and right sides of the brain, ensuring unified function.

59. (C) Oxytocin
The pituitary gland is divided into the anterior and posterior lobes. The anterior pituitary synthesizes and secretes several hormones, including growth hormone, prolactin, and thyroid-stimulating hormone. In contrast, oxytocin and antidiuretic hormone are actually synthesized by neurons in the hypothalamus. These hormones are then transported down the axons to the posterior pituitary, where they are stored and eventually released into circulation.

60. (B) Reflex arc
A reflex arc is a specific neural pathway that bypasses conscious thought to produce a rapid, involuntary response to a stimulus. It typically consists of five main components: a sensory receptor, an afferent sensory neuron, an integration center within the spinal cord, an efferent motor neuron, and an effector organ. This efficient circuit allows the body to react immediately to potentially harmful stimuli.

61. (C) Spleen
Lymphoid organs are categorized based on their roles in lymphocyte development. Primary lymphoid organs, such as the bone marrow and thymus, are the sites where lymphocytes are produced and undergo maturation. Secondary lymphoid organs, including the spleen and lymph nodes, are where mature immune cells reside and encounter antigens. Therefore, while the spleen is critical for immune function, it is considered a secondary organ.

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62. (B) Proximal
Anatomical directional terms are used to describe the relative positions of body structures. The term proximal refers to a structure that is situated closer to the trunk of the body or the point of attachment for a limb. For example, the elbow is proximal to the wrist. Conversely, the term distal describes a position that is further away from the point of attachment.

63. (A) Hyoid
The human middle ear contains three tiny bones known as the auditory ossicles, which include the malleus, incus, and stapes. These bones work together to transmit and amplify sound vibrations from the eardrum to the inner ear. The hyoid bone, however, is a horse-shoe shaped bone located in the neck. It serves as an attachment point for tongue muscles and does not participate in hearing.

64. (C) Appendix
Several organs collaborate to maintain fluid and electrolyte homeostasis in the human body. The kidneys are the primary regulators of water and salt excretion. The skin assists through sweating, while the lungs contribute by losing water vapor during respiration. The appendix is a small, finger-like projection of the cecum and is considered a vestigial organ with no role in maintaining fluid balance.

65. (A) III only
Homeostasis involves various physiological adjustments to maintain a stable internal environment. To manage temperature, the body utilizes mechanisms like sweating for cooling and shivering for heating. However, the hypothalamus, not the medulla oblongata, serves as the primary control center for thermoregulation. The hypothalamus acts as a thermostat, sensing blood temperature and triggering appropriate responses to maintain the set point of the body.

66. (A) P-4, Q-1, R-2, S-3
Many diseases are directly associated with the failure of specific organ systems. Glaucoma is a condition of the eye involving increased intraocular pressure. Angina pectoris refers to chest pain resulting from reduced blood flow to the heart. Jaundice is a symptom of liver dysfunction characterized by yellowing of the skin. Uremia occurs when the kidneys fail to filter urea and other wastes.

67. (C) Sebaceous glands exclusively secrete sweat to regulate body temperature
Human skin is a complex organ with multiple layers and specialized structures. The epidermis provides a waterproof barrier, while the dermis contains various sensory receptors and blood vessels. Sweat glands are responsible for secreting sweat to facilitate thermoregulation. However, sebaceous glands have a different function; they secrete an oily substance called sebum that lubricates the skin and hair, providing moisture and protection.

68. (B) In joint cavities, providing lubrication to cartilage
Synovial fluid is a viscous, clear liquid primarily located within the cavities of synovial joints. Its main physiological function is to reduce friction between the articular cartilages of moving bones during physical activity. By providing essential lubrication and shock absorption, it ensures smooth joint movement. Additionally, this fluid serves to distribute nutrients to the chondrocytes within the avascular articular cartilage tissue.

69. (A) The maintenance of a relatively stable internal environment despite external fluctuations
Homeostasis is a fundamental biological principle referring to the ability of an organism to maintain a stable internal environment. Despite constant fluctuations in external conditions, such as temperature or nutrient availability, the body employs various feedback mechanisms to keep internal variables like pH and blood glucose within a narrow, optimal range. This dynamic equilibrium is essential for survival and proper functioning.

70. (C) Vitamin K
Vitamin K is a fat-soluble vitamin that serves as an essential cofactor for the synthesis of several blood clotting factors in the liver. Specifically, it is required for the production of prothrombin, as well as factors seven, nine, and ten. A deficiency in this vitamin can significantly impair the coagulation process, leading to an increased risk of excessive bleeding and bruising.

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71. (A) Sarcopenia
As humans age, they often experience a progressive and involuntary reduction in skeletal muscle mass and functional strength. This biological phenomenon is scientifically known as sarcopenia. It is characterized by a decrease in both the size and number of muscle fibers, often leading to reduced mobility and an increased risk of falls. Maintaining physical activity and adequate protein intake can help mitigate its effects.

72. (A) Both A and R are true and R is the correct explanation of A.
Vaccination is a highly effective medical intervention that provides long-lasting protection against infectious diseases. This immunity is achieved because vaccines introduce weakened or inactivated pathogens to the immune system. This exposure stimulates the production of memory B and T cells. These specialized cells remain in the body and can rapidly recognize and attack the actual pathogen if it ever enters the system again.

73. (D) P-2, Q-3, R-4, S-1
Essential nutrients play diverse roles in human physiology. Iron is a key component for the formation of hemoglobin in red blood cells. Calcium is vital for bone health, muscle contraction, and the blood clotting process. Vitamin B12 is necessary for the proper maturation of erythrocytes. Vitamin D facilitates the intestinal absorption of calcium. Together, these substances ensure the maintenance of structural integrity.

74. (C) Cirrhosis - Excretory System (Kidneys)
Many chronic diseases are identified by the organ system they predominantly affect. Asthma is a respiratory condition, and myocardial infarction is a cardiovascular event. Rheumatoid arthritis primarily impacts the skeletal joints through inflammation. However, cirrhosis is a late-stage scarring of the liver and is therefore a disease of the digestive system rather than the excretory system, although it affects overall metabolism.

75. (C) Statement I is correct but Statement II is incorrect
The aging process leads to several predictable physiological changes. There is typically a gradual decrease in bone mineral density, which increases the susceptibility to osteoporosis and fractures. Contrary to increasing elasticity, blood vessels generally become stiffer and less flexible with age. This loss of elasticity increases vascular resistance, which often leads to a rise in blood pressure, rather than a decrease.

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76. (D) Melanin
Human skin color is primarily determined by a dark pigment called melanin, which is produced by specialized cells known as melanocytes. These cells are located in the basal layer of the epidermis. The concentration and type of melanin present are influenced by genetic factors and exposure to ultraviolet radiation. This pigment serves a vital protective role by absorbing harmful UV rays.

77. (D) Uncontrolled hypertension and high blood sugar levels
Chronic kidney disease is often driven by long-term lifestyle-related health conditions. Persistent, uncontrolled hypertension can damage the small blood vessels within the kidneys, impairing their filtration capacity. Similarly, chronically high blood sugar levels associated with diabetes can cause structural damage to the nephrons. Managing these conditions through diet and medication is essential for preserving renal function and preventing the progression of disease.

78. (D) I, II, and IV only
Antibodies are specialized immunoglobulin proteins with a unique four-chain structure consisting of two light and two heavy chains. While T-lymphocytes do not secrete antibodies directly, they are essential for assisting B-lymphocytes in their production. It is important to note that humoral immunity is mediated by B-cells, whereas cell-mediated immunity is specifically the domain of T-lymphocytes rather than B-lymphocytes.

79. (B) Thrombokinase
The coagulation of blood is a complex cascade of enzymatic reactions initiated by tissue injury. A critical step in this process is the conversion of the inactive plasma protein prothrombin into the active enzyme thrombin. This specific transformation is catalyzed by an enzyme complex known as thrombokinase, also called

prothrombinase. Once formed, thrombin then proceeds to convert soluble fibrinogen into insoluble fibrin.

80. (C) Statement I is correct but Statement II is incorrect
Biological aging significantly influences the performance of various organ systems. During exercise, the maximum heart rate that an individual can achieve generally declines as they get older. Additionally, the nervous system undergoes changes where the speed of nerve impulse conduction typically slows down rather than increases. This reduction in conduction velocity can lead to slower reaction times and altered sensory perceptions.

81. (C) Loss of lens elasticity causing difficulty in near focusing
Presbyopia is a common age-related vision condition that typically becomes noticeable after the age of forty. It is primarily caused by the gradual loss of elasticity in the lens of the eye and the weakening of the ciliary muscles. This structural change reduces the eye's ability to accommodate, making it increasingly difficult to focus on close objects, such as reading materials.

82. (A) Innate immunity is present from birth; acquired develops later
Innate immunity refers to the non-specific defense mechanisms that are present from birth, such as physical barriers and phagocytic cells. In contrast, acquired immunity is highly specific and develops throughout life as the body is exposed to various pathogens. Unlike innate defenses, acquired immunity involves the creation of memory cells, which provide a faster and more effective response upon re-exposure to pathogens.

83. (D) A mechanism where the output reduces the original stimulus
Negative feedback is the most common mechanism used by the body to maintain homeostasis. It functions by detecting a deviation from a physiological set point and initiating a response that opposes or reduces the original stimulus. For instance, if body temperature rises, negative feedback mechanisms trigger cooling processes like sweating to return the temperature to its normal, stable level.

84. (C) It plays a crucial role in osmoregulation, thirst, and body temperature homeostasis
The hypothalamus is a vital region of the brain that serves as the main integration center for the autonomic nervous system. It plays a central role in maintaining homeostasis by regulating core body temperature, thirst, and hunger. Furthermore, it controls the endocrine system by producing hormones that regulate the anterior pituitary and by synthesizing hormones stored in the posterior pituitary.

85. (C) Thromboplastin
The process of blood coagulation is triggered immediately following a vascular injury. When tissues are damaged and platelets are activated at the site of the wound, they release a vital substance known as thromboplastin. This factor initiates a sequence of biochemical reactions that ultimately lead to the formation of a stable fibrin clot, preventing further blood loss and facilitating repair.

86. (B) Immunity developed by the body upon exposure to an antigen
Active immunity is a type of long-term protection that develops when the body's own immune system is exposed to a foreign antigen. This exposure can occur naturally through an infection or artificially through a vaccine. In response, the body produces its own antibodies and memory cells. This process ensures a rapid and robust defense if the same pathogen is encountered.

87. (B) Emphysema
Emphysema is a chronic respiratory disorder characterized by the progressive destruction of the alveolar walls within the lungs. This damage leads to a significant reduction in the surface area available for gas exchange. The primary cause of this condition is long-term exposure to irritants, most notably cigarette smoking. Individuals with emphysema often experience shortness of breath due to impaired lung function.

88. (B) Thrombin - Converts soluble fibrinogen into insoluble fibrin threads
Several substances are essential for the successful coagulation of blood. Thrombin is a key active enzyme that catalyzes the conversion of soluble fibrinogen into insoluble fibrin threads. These threads form a mesh-like network that traps

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blood cells and stabilizes the clot. Calcium ions are also required as essential cofactors, while heparin actually acts as an anticoagulant to prevent unnecessary clotting.

89. (B) Hemophilia
Hemophilia is a hereditary genetic disorder that impairs the body's ability to control blood clotting. It is characterized by the absence or deficiency of specific clotting factors, such as factor eight or nine. Individuals with this condition experience prolonged bleeding after even minor injuries, as the normal coagulation cascade cannot be completed efficiently. Management often involves regular replacement of missing factors.

90. (A) The deposition of calcium and cholesterol plaques in the inner walls of arteries
Atherosclerosis is a cardiovascular disease primarily driven by the progressive buildup of plaques within the inner walls of the arteries. These plaques are composed of cholesterol, fatty substances, cellular waste, and calcium. Over time, this accumulation causes the arteries to narrow and lose their elasticity, significantly restricting blood flow to vital organs and increasing the risk of heart attack.

91. (A) Both Statement I and Statement II are correct
The lymphatic system facilitates the return of excess interstitial fluid to the blood. Most of the body's lymph, including that from the lower limbs and the left side of the head and chest, is collected by the thoracic duct. This major vessel then empties the filtered lymph into the left subclavian vein, where it reintegrates with the systemic venous circulation.

92. (C) Intracellular fluid
Total body water is distributed among several distinct fluid compartments. The largest of these is the intracellular fluid, which is the fluid contained within all the body's cells. In a healthy adult, it accounts for approximately two-thirds of the total body water. The remaining one-third is extracellular fluid, which is subdivided into interstitial fluid, blood plasma, and other specialized fluids.

93. (D) Telomeres
Telomeres are repetitive DNA sequences located at the terminal ends of chromosomes. They function to protect genetic information during cell division. However, each time a cell divides, the telomeres progressively shorten. Once they reach a critically short length, the cell can no longer divide and enters a state of senescence. This shortening is a fundamental biological driver of cellular aging.

94. (C) III, IV, V, II, I
Biological systems are organized into a hierarchical structure of increasing complexity. The simplest functional level is the cell. Groups of similar cells aggregate to form tissues, which then combine to create organs. Multiple organs work together in integrated organ systems to perform complex physiological tasks. Finally, all organ systems collectively constitute the entire organism, representing the highest level of hierarchy.

95. (A) Right Atrium, Right Ventricle, Pulmonary Artery, Lungs, Pulmonary Vein, Left Atrium, Left Ventricle, Aorta
Deoxygenated blood returns from the body to the right atrium and moves into the right ventricle. It is then pumped through the pulmonary artery to the lungs for oxygenation. Oxygenated blood returns via the pulmonary vein to the left atrium and enters the left ventricle. Finally, it is ejected through the aorta into the systemic circulation to deliver oxygen.

96. (B) Digestive System - Significant increase in the secretion of gastric juices and metabolism
Aging impacts human organ systems in various ways. The immune system becomes less responsive, and the brain often experiences a decrease in neuron count. The cardiovascular system is characterized by arterial stiffening. However, the digestive system generally experiences a reduction, rather than an increase, in the secretion of gastric juices and metabolic rate. This often leads to slower digestion.

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97. (A) Nucleoplasm
Extracellular fluid encompasses all body fluids found outside of the cells. This category includes interstitial fluid, blood plasma, and specialized transcellular fluids like cerebrospinal fluid and aqueous humor. Nucleoplasm, however, is a type of protoplasm located specifically within the nucleus of a cell. Since it is contained within the

nuclear envelope inside the cell, it is classified as intracellular fluid.

98. (B) Osmoregulation
Osmoregulation is the physiological process by which the human body maintains the balance of water and dissolved salts. This mechanism ensures that the osmotic pressure of body fluids remains within a narrow range, preventing cells from shrinking or swelling excessively. The kidneys are the primary organs involved in this process, adjusting the concentration of urine in response to hydration levels.

99. (D) Cytosol
Body fluids are broadly classified as either intracellular or extracellular. Cerebrospinal fluid, synovial fluid, and blood plasma are all examples of extracellular fluids because they exist outside the cell boundaries. Cytosol, however, is the liquid component of the cytoplasm found within the cell membrane. Therefore, it is classified as intracellular fluid, making it the odd one out in this group.

100. (C) 50 to 65 percent
Water is the most abundant chemical constituent of the human body and is essential for all metabolic processes. In an average healthy adult, water typically accounts for approximately fifty to sixty-five percent of the total body weight. This percentage can vary slightly based on factors such as age, gender, and the proportion of adipose tissue, as fat contains less water.

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CHAPTER 05

Nutrition, Food, Nutrients and Malnutrition

1. The human body requires certain essential amino acids through diet because it cannot synthesize them. Which of the following is the odd one out, as it is a non-essential amino acid?
(A) Leucine
(B) Tryptophan
(C) Valine
(D) Alanine

2. Water constitutes a significant portion of the human body. Which of the following is not a primary function of water as a nutrient?
(A) Acting as a medium for biochemical reactions
(B) Regulating body temperature through sweating
(C) Providing directly metabolizable caloric energy
(D) Transporting nutrients and waste products

3. Which of the following statements correctly differentiates between macronutrients and micronutrients?
(A) Macronutrients are solely from plants, while micronutrients are from animals
(B) Macronutrients include vitamins, while micronutrients include fats and proteins
(C) Macronutrients provide energy/structure; micronutrients regulate physiology
(D) Macronutrients cannot be stored, while all micronutrients are stored in fat

4. Nutritional demands increase during pregnancy. Which of the following micronutrients is particularly emphasized in the first trimester to prevent neural tube defects in the developing fetus?
(A) Vitamin C
(B) Calcium
(C) Folic Acid
(D) Vitamin A

5. A patient presents with bleeding gums, delayed wound healing, and joint pain. The physician recommends an increased intake of citrus fruits. The deficiency of which specific nutrient is the primary cause of these symptoms?
(A) Retinol
(B) Ascorbic acid
(C) Calciferol
(D) Phylloquinone

6. Consider the following statements regarding nutritional deficiency diseases in children:
I. Kwashiorkor is primarily caused by severe protein deficiency despite adequate caloric intake.
II. Marasmus is characterized by severe wasting of muscle and subcutaneous fat.
III. Children with kwashiorkor typically present with a moon face and bilateral pitting edema.
IV. Marasmus usually affects children older than five years due to exclusively high-carbohydrate diets.
Which of the above statement(s) is/are correct?
(A) I, II, and III
(B) II, III, and IV
(C) I, III, and IV
(D) I, II, and IV

7. Which of the following best defines nutrition in the context of human biology?
(A) The physical and mechanical breakdown of food in the digestive tract
(B) The biological process of using food to sustain life functions
(C) The complex synthesis of organic compounds from inorganic molecules
(D) The systematic elimination of metabolic wastes from the human body

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8. Among the B-complex vitamins, the deficiency of Thiamine (B1) is most famously associated with which of the following diseases?
(A) Pellagra
(B) Beriberi
(C) Scurvy
(D) Rickets

9. Consider the following steps in the process of fat digestion and absorption:
1. Formation of micelles
2. Emulsification by bile salts
3. Secretion of pancreatic lipase
4. Absorption into intestinal cells

Which of the following represents the correct sequence of these steps?
(A) 2, 3, 1, 4
(B) 3, 2, 1, 4
(C) 1, 2, 3, 4
(D) 2, 1, 3, 4

10. In the context of dietary fats, which of the following is identified as a health risk associated with high consumption of trans fats?
(A) Increased production levels of High-Density Lipoprotein (HDL) cholesterol molecules
(B) Significantly enhanced absorption of water-soluble vitamins within the gut
(C) Elevated Low-Density Lipoprotein (LDL) levels and increased risk of heart disease
(D) Rapid and total depletion of fat-soluble vitamins stored within the liver tissue

11. Night blindness (Nyctalopia) is one of the earliest signs of a specific nutritional deficiency. Which physiological mechanism directly explains this condition?
(A) Hardening of the cornea caused by excessive Vitamin D toxicity
(B) Disruption of optic nerve transmission due to Vitamin B12 deficiency
(C) Impaired blood flow to the eyes resulting from severe iron deficiency
(D) Lack of Vitamin A prevents rhodopsin synthesis in the rod cells

12. Match the items in List I with those in List II.
List I: (Nutrient Component)
P. Glucose
Q. Amino acids
R. Triglycerides
S. Dietary fibre
List II: (Primary Biological Role)
1. Long-term energy storage and insulation
2. Prevention of constipation and bowel regulation
3. Primary energy source for cellular respiration
4. Tissue repair and enzyme synthesis
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-1, R-4, S-2
(C) P-3, Q-4, R-1, S-2
(D) P-1, Q-4, R-3, S-2

13. Iodine is an essential trace mineral required for human health. What is its principal function?
(A) Synthesis of thyroxine and triiodothyronine
(B) Formation of bone tissue and teeth enamel
(C) Regulation of fluid balance inside the cells
(D) Transmission of nerve impulses across synapses

14. Which of the following is a negative or exception-based fact regarding water-soluble vitamins?
(A) They are generally not stored in large functional amounts in the human body
(B) They include the entire B-complex group and other essential water-soluble acids
(C) They require bile salts for efficient absorption in the small intestine
(D) Excess amounts are primarily excreted through urine via the renal filtration system

15. Growth monitoring in children relies on specific anthropometric measurements. Which among the following is not a standard parameter used in routine child growth monitoring?
(A) Weight-for-age
(B) Height-for-age
(C) Mid-upper arm circumference (MUAC)
(D) Bone mineral density scan

16. Based on their primary physiological functions, foods can be classified into different groups. Which of the following is an incorrect classification?
(A) Regulatory foods: Dietary fibre and sugars
(B) Energy-yielding foods: Carbohydrates and fats
(C) Body-building foods: Proteins
(D) Protective foods: Vitamins and minerals

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17. Caloric requirements vary significantly across different population groups. Which factor is generally considered least influential in determining a healthy adult's basal metabolic rate (BMR)?
(A) Frequency of dietary fibre intake
(B) Amount of lean body mass
(C) Chronological age of the adult
(D) Biological gender of the person

18. Which of the following statements best describes the function of essential fatty acids like Omega-3 and Omega-6?
(A) They maintain cell membrane integrity and assist in synthesizing prostaglandins
(B) They serve as the primary structural component for the entire skeletal system
(C) They are solely responsible for transporting oxygen throughout the bloodstream
(D) They prevent the breakdown of complex dietary fibre in the small intestine

19. Which of the following represents the correct sequence of physiological responses to increasing dehydration in the human body?
(A) Thirst sensation, decreased urine output, rapid heart rate, confusion
(B) Rapid heart rate, thirst sensation, confusion, decreased urine output
(C) Decreased urine output, rapid heart rate, thirst sensation, confusion
(D) Confusion, thirst sensation, decreased urine output, rapid heart rate

20. Read the given Assertion (A) and Reason (R) carefully and select the correct option.
Assertion (A): Calcium cannot be adequately absorbed from the intestinal tract in the absence of Vitamin D.
Reason (R): Vitamin D stimulates the synthesis of calcium-binding proteins in the intestinal epithelial cells.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

21. Consider the following clinical presentation and answer the question that follows:
A 2-year-old child presents with a distended abdomen, thin limbs, and reddish discolouration of hair. The child consumes a diet primarily of starchy gruels.
This clinical picture is a classic demonstration of which condition?
(A) Iron-deficiency anemia
(B) Marasmus
(C) Kwashiorkor
(D) Scurvy

22. Proteins are critical for body building and repair. Which of the following represents the correct cause-and-effect relationship regarding protein deficiency?
(A) Decreased protein intake results in enhanced muscle synthesis through metabolic compensation
(B) Severe protein deficiency causes fluid retention and edema by reducing blood osmotic pressure
(C) Insufficient dietary protein significantly accelerates the absorption rate of fat-soluble vitamins
(D) Chronic protein deficiency primarily leads to the excessive calcification of the major long bones

23. Which of the following micronutrients functions as a crucial co-factor for numerous antioxidant enzymes and is necessary for maintaining a healthy immune system?
(A) Sodium
(B) Phosphorus
(C) Chloride
(D) Zinc

24. A balanced diet should provide calories from different macronutrients in specific proportions. According to general dietary guidelines, what is the most appropriate distribution of total daily energy?
(A) 10-15% Carbohydrates, 50-60% Proteins, 20-30% Fats
(B) 30-40% Carbohydrates, 30-40% Proteins, 20-30% Fats
(C) 70-80% Carbohydrates, 5-10% Proteins, 10-15% Fats
(D) 50-60% Carbohydrates, 10-15% Proteins, 20-30% Fats

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25. Which of the following statements about Iron as a mineral in the human body is incorrect?
(A) It acts as a central component of the hemoglobin molecule within blood
(B) Heme iron from plants is more easily absorbed than non-heme iron
(C) Vitamin C enhances the absorption of non-heme iron from various plant sources
(D) Iron deficiency is the most common cause of anemia in populations worldwide

26. Consider the following statements regarding the functions of carbohydrates:
Statement I: Carbohydrates are the primary and most immediate source of energy for the human brain.
Statement II: Excess carbohydrates are stored in the liver and muscles exclusively as starch.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

27. Consider the following statements regarding the nutritional needs of lactating women:
Statement I: A lactating mother requires fewer calories than she did during the third trimester of pregnancy.
Statement II: The calcium requirement of a lactating mother is significantly higher to support milk production.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

28. Consider the following statements regarding the classification of vitamins:
I. Vitamin A is fat-soluble and essential for vision.
II. Vitamin C is water-soluble and helps in collagen synthesis.
III. Vitamin K is water-soluble and aids in blood clotting.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

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29. Dietary fibre is widely recommended for a healthy digestive system. What makes fibre uniquely different from other carbohydrates like starch?
(A) It is absorbed rapidly into the bloodstream
(B) It contains twice as many calories per gram as starch
(C) It cannot be broken down by human digestive enzymes
(D) It is exclusively found in animal-based food products

30. Identify the correct pair of a fat-soluble vitamin and its primary dietary source.
(A) Vitamin D - Citrus fruits
(B) Vitamin K - Refined sugar
(C) Vitamin A - Egg whites only
(D) Vitamin E - Vegetable oils and nuts

31. Obesity is increasingly recognized as a form of malnutrition. Which of the following Body Mass Index (BMI) values is generally classified as obese for adults according to standard WHO guidelines?
(A) 18.5 - 24.9
(B) 25.0 - 29.9
(C) 30.0 and above
(D) Below 18.5

32. Food adulteration is a serious public health hazard. Argemone oil is often mixed with mustard oil for economic gains. Consumption of such adulterated oil leads to which serious disease?
(A) Lathyrism
(B) Epidemic Dropsy
(C) Minamata disease
(D) Fluorosis

33. Severe iodine deficiency during pregnancy can lead to irreversible physical and mental

retardation in the child. What is this specific condition called?
(A) Acromegaly
(B) Cretinism
(C) Gigantism
(D) Myxedema

34. Match the items in List I with those in List II.
List I: (Functional Food/Nutraceutical)
P. Tomatoes
Q. Green Tea
R. Turmeric
S. Garlic
List II: (Primary Active Compound)
1. Curcumin
2. Allicin
3. Lycopene
4. Catechins
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-1, R-4, S-2
(C) P-1, Q-2, R-3, S-4
(D) P-3, Q-4, R-1, S-2

35. Consider the following components regarding child development services:
I. Supplementary Nutrition
II. Pre-school non-formal education
III. Nutrition and health education
IV. Immunization
V. Tertiary hospital care for surgical interventions
Which of the above components are typically provided under such comprehensive schemes?
(A) I, II, III, and V
(B) I, II, III, and IV
(C) II, III, IV, and V
(D) I, III, IV, and V

36. Blanching is a cooking process often used before freezing vegetables. What is the primary nutritional and functional objective of blanching?
(A) Deactivate enzymes causing loss of flavour, colour, and texture
(B) Significantly increase the total fat content of the vegetables
(C) Permanently sterilize the food from all heat-resistant spores
(D) Convert complex carbohydrates into simple monosaccharide sugars

37. Vitamin A deficiency leads to a spectrum of ocular manifestations collectively termed as xerophthalmia. Which of the following represents an advanced and irreversible stage of this condition?
(A) Keratomalacia
(B) Conjunctival xerosis
(C) Bitot's spots
(D) Night blindness

38. Under food security regulations, eligible households are entitled to receive food grains at subsidized prices. Which pair correctly matches the food grain with its typical subsidized price?
(A) Wheat: Rs. 5 per kg
(B) Coarse grains: Rs. 2 per kg
(C) Pulses: Rs. 1 per kg
(D) Rice: Rs. 3 per kg

39. Which of the following best defines "Organic Food"?
(A) Food processed artificially to increase its overall shelf life
(B) Food fortified with extra vitamins and minerals in a laboratory
(C) Food specifically genetically modified to achieve higher yields
(D) Food grown without synthetic pesticides or chemical fertilizers

40. Which of the following indicators is an acute measure of malnutrition, reflecting recent severe weight loss often due to acute starvation or severe disease?
(A) Stunting
(B) Dental caries
(C) Osteomalacia
(D) Wasting

41. Street food in urban centres poses safety challenges. What is the most common health risk associated with consuming unhygienic street food?
(A) Chronic nutritional deficiencies such as clinical scurvy
(B) Foodborne illnesses like gastroenteritis and typhoid
(C) Severe protein-energy malnutrition like Kwashiorkor
(D) Bone-related disorders including pediatric rickets

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42. Match the items in List I with those in List II.
List I: (Form of Malnutrition)
P. Stunting
Q. Wasting
R. Underweight
S. Overweight
List II: (Diagnostic Definition)
1. Low weight-for-height
2. High weight-for-height
3. Low height-for-age
4. Low weight-for-age
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-1, R-4, S-3
(C) P-3, Q-1, R-4, S-2
(D) P-4, Q-3, R-2, S-1

43. Select the correct sequence of steps involved in ensuring food security at the national level, starting from the source to the beneficiary.
(A) Procurement by central agency → Storage → Allocation to States → Distribution via Fair Price Shops
(B) Storage → Procurement by central agency → Distribution via Fair Price Shops → Allocation to States
(C) Allocation to States → Procurement by central agency → Storage → Distribution via Fair Price Shops
(D) Procurement by central agency → Allocation to States → Storage → Distribution via Fair Price Shops

44. School nutrition programs have specific norms for children. What is the mandated minimum caloric and protein content to be provided to primary school children (Classes I-V) per day?
(A) 300 calories and 8-12 grams of protein
(B) 700 calories and 20 grams of protein
(C) 1000 calories and 25 grams of protein
(D) 450 calories and 12 grams of protein

45. The method of cooking significantly impacts the nutrient content of food. Which vitamin is most susceptible to destruction by heat during prolonged boiling?
(A) Vitamin A
(B) Vitamin D
(C) Vitamin C
(D) Vitamin K

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46. Which of the following is a primary strategy commonly implemented to combat iron deficiency anemia in high-prevalence populations?
(A) Distribution of free Vitamin C tablets weekly
(B) Weekly Iron and Folic Acid Supplementation (WIFS)
(C) Mandatory fortification of all dairy products with zinc
(D) Provision of monthly iodine injections

47. Functional foods are defined as foods that:
(A) Items that provide purely empty calories for immediate energy
(B) Bioactive components providing health benefits beyond basic nutrition
(C) Goods heavily processed to remove all naturally occurring fats
(D) Products serving as medicinal drugs requiring a prescription

48. In many regions, specific socio-economic factors contribute significantly to high malnutrition rates. Which of the following is a direct cause?
(A) High prevalence of fast-food chains replacing traditional diets
(B) Lack of food security, seasonal migration, and poor maternal health
(C) Over-reliance on highly refined wheat flour and processed meats
(D) Excessive consumption of fortified cereals distributed by the government

49. Metanil yellow is a non-permitted dye occasionally used as a food adulterant. Which food product is most commonly adulterated with this chemical to enhance its appearance?
(A) Turmeric powder (Haldi)
(B) Milk
(C) Black pepper
(D) Honey

50. In the context of food security, Public Distribution Systems (PDS) aim to distribute subsidized food grains. What is a common challenge faced by these systems in rural areas?
(A) Overabundance of nutritional diversity in PDS shops
(B) Refusal of citizens to consume wheat and rice

(C) Leakages, inclusion/exclusion errors, and logistical challenges
(D) High costs of organic foods sold in fair price shops

51. Sprouting (germination) of pulses is highly recommended by nutritionists. What happens to the nutritional value of pulses upon sprouting?
(A) The protein content becomes entirely indigestible
(B) The iron content decreases to negligible amounts
(C) The dietary fibre is completely destroyed
(D) Vitamin C and B-complex vitamins increase significantly

52. Malnutrition is a broad term that encompasses different nutritional states. Which of the following correctly identifies a form of malnutrition?
(A) Undernutrition only
(B) Overnutrition only
(C) Both undernutrition and micronutrient deficiencies, but not overnutrition
(D) Undernutrition, overnutrition, and micronutrient imbalances

53. Identify the incorrect statement regarding national nutrition missions and interventions.
(A) They aim to reduce stunting, under-nutrition, anemia, and low birth weight
(B) They emphasize the use of technology for monitoring and convergence of schemes
(C) They exclusively target urban metropolitan areas to reduce childhood obesity
(D) They operate actively through a network of community-based health centers

54. Which of the following is not considered a potential benefit of organic farming?
(A) Preservation of soil biodiversity
(B) Reduction in chemical runoff into water bodies
(C) Increased dependency on synthetic fertilizers
(D) Lower pesticide residue in final food products

55. Consider the following statements about the Antyodaya Anna Yojana (AAY):
Statement I: It targets the poorest of the poor families identified by the government.
Statement II: Each AAY household is entitled to 35 kg of food grains per month.
Which of the above statement(s) is/are correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

56. Vitamin D deficiency in adults leads to impaired bone mineralization, causing bone pain and muscle weakness. What is the clinical name for this condition?
(A) Osteomalacia
(B) Osteoporosis
(C) Rickets
(D) Paget's disease

57. Nutraceuticals bridge the gap between nutrition and medicine. Probiotics fall under this category. What is the primary role of probiotics in the human body?
(A) They are live beneficial bacteria that improve gut flora health
(B) They are indigestible fibres that stimulate bowel movements
(C) They are synthetic enzymes that break down lactose
(D) They act as powerful antioxidants neutralizing free radicals in the blood

58. Regarding child malnutrition parameters, which statement is true about 'Stunting'?
(A) It is a measure of chronic malnutrition resulting in low height-for-age
(B) It is defined as a low weight-for-height ratio
(C) It reflects acute, short-term nutritional deficiency
(D) It can be quickly reversed with a few weeks of adequate feeding

59. The Food Safety and Standards Authority of India (FSSAI) operates under which Ministry of the Government of India?
(A) Ministry of Agriculture and Farmers Welfare
(B) Ministry of Consumer Affairs, Food and

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Public Distribution
(C) Ministry of Health and Family Welfare
(D) Ministry of Food Processing Industries

60. School-based meal programs play a dual role in society. Besides improving the nutritional status of children, what is a primary educational objective?
(A) Provide formal vocational training in cooking
(B) Improve enrollment, retention, and attendance
(C) Eliminate the need for physical education classes
(D) Fund the development of school infrastructure

61. The first 1,000 days of life are considered a critical window of opportunity for child nutrition. This period encompasses:
(A) From the first birthday to the third birthday
(B) From conception through the child's second birthday
(C) The first 1,000 days starting from the day of birth
(D) The preschool years from age 3 to age 5

62. Glycogen is the primary storage form of carbohydrates in animals. In which two organs is glycogen predominantly stored in the human body?
(A) Liver and Skeletal Muscles
(B) Brain and Heart
(C) Kidneys and Pancreas
(D) Spleen and Lungs

63. Auxiliary Nurse Midwives (ANMs) play a crucial role in rural health. What is a primary nutritional responsibility of an ANM?
(A) Administering Vitamin A and IFA to children and mothers
(B) Distributing fortified rice to local Fair Price Shops
(C) Supervising the cooking of Mid-Day Meals in schools
(D) Formulating comprehensive state food security policies

64. Phytic acid, found in grains and legumes, can negatively impact human nutrition. What is its primary anti-nutritional effect?
(A) It destroys Vitamin C within the gastrointestinal tract
(B) It accelerates the breakdown of functional muscle proteins
(C) It binds minerals like iron and zinc, reducing absorption
(D) It prevents the proper digestion of complex carbohydrates

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65. Food fortification is promoted to combat micronutrient deficiencies. What does the '+F' logo on food packets signify?
(A) The food is fortified with essential micronutrients
(B) The food is free from all chemical artificial flavours
(C) The food contains high levels of excess dietary fats
(D) The food is strictly grown using organic techniques

66. Arrange the following common cooking methods in decreasing order of their tendency to cause loss of water-soluble vitamins (from highest loss to lowest loss):
1. Prolonged Boiling
2. Steaming
3. Microwaving

Which of the following represents the correct sequence?
(A) 1, 2, 3
(B) 3, 2, 1
(C) 2, 1, 3
(D) 1, 3, 2

67. Which specific initiative was launched to upgrade the safety and hygiene of street food vendors in India?
(A) Swachh Bhojan Abhiyan
(B) Poshan Pakhwada
(C) Clean Street Food Hub
(D) National Food Vendors Scheme

68. Pellagra is a nutritional deficiency disease characterized by the "4 Ds": Diarrhoea, Dermatitis, Dementia, and Death. Which vitamin deficiency causes Pellagra?
(A) Riboflavin (B2)
(B) Niacin (B3)
(C) Pyridoxine (B6)
(D) Pantothenic Acid (B5)

69. Consider the following symptoms of a specific condition:
I. Pale conjunctiva and skin
II. Fatigue and weakness
III. Koilonychia (spoon-shaped nails)
IV. Pica (craving for non-food items like dirt)
V. Swollen thyroid gland
Which of the above symptoms reflect the clinical signs of Iron Deficiency Anemia?
(A) I, II, III, and IV
(B) I, II, IV, and V
(C) II, III, IV, and V
(D) I, III, IV, and V

70. Children with Severe Acute Malnutrition (SAM) are often referred to specific centres for medical and nutritional rehabilitation. What are these centres called?
(A) Primary Health Centres (PHC)
(B) Training Centres (TC)
(C) Nutritional Rehabilitation Centres (NRC)
(D) Community Health Centres (CHC)

71. In the context of maternal nutrition, an inadequate weight gain during pregnancy is strongly associated with which adverse outcome?
(A) Low Birth Weight (LBW) infant
(B) Gestational diabetes
(C) Macrosomia (large baby)
(D) Postpartum hemorrhage

72. "Take Home Ration" (THR) distributed through community centers is primarily aimed at which demographic group?
(A) School-going children between the ages of 6 to 14 years
(B) Pregnant women, lactating mothers, and young children
(C) Adult males employed under various state labor programs
(D) Elderly citizens above the age of 65 living in poverty

73. Which of the following is an example of a monosaccharide, the simplest form of carbohydrate?
(A) Sucrose
(B) Lactose
(C) Starch
(D) Glucose

74. Which of the following essential commodities is most commonly fortified with Iodine to prevent goitre?
(A) Edible oil
(B) Wheat flour
(C) Common salt
(D) Milk

75. Standard public health guidelines mandate the fortification of milk and edible oils with which two specific vitamins?
(A) Vitamin B1 and B2
(B) Vitamin C and E
(C) Vitamin K and Folic acid
(D) Vitamin A and D

76. Consider the following components regarding a balanced diet:
I. Sufficient energy to maintain ideal body weight.
II. Proteins for tissue maintenance.
III. Complete exclusion of all dietary fats.
Which of the above statement(s) is/are incorrect?
(A) I and II only
(B) II and III only
(C) III only
(D) I only

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77. Regarding hydration, which hormone is primarily responsible for regulating water excretion by the kidneys?
(A) Insulin
(B) Thyroxine
(C) Parathyroid Hormone (PTH)
(D) Antidiuretic Hormone (ADH)

78. Match the items in List I with those in List II.
List I: (Health Initiative/Scheme)
P. Dastak Abhiyan
Q. Atal Bihari Vajpayee Bal Arogya evam Poshan Mission
R. Lado Abhiyan
S. Annapurna Scheme
List II: (Primary Target/Component)
1. Eradication of child malnutrition
2. Door-to-door screening for severe acute malnutrition (SAM)
3. Food security for senior citizens not covered under pension
4. Eradication of child marriage
(A) P-1, Q-2, R-3, S-4

(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-2, Q-1, R-4, S-3

79. Identify the incorrect statement regarding dietary fats.
(A) Fats yield approximately 9 kilocalories of energy per gram
(B) Cholesterol is found abundantly in all plant oils
(C) Saturated fats are typically solid at room temperature
(D) Bile is essential for the emulsification of dietary fats

80. Consider the following statements regarding the absorption of nutrients:
I. Vitamin B12 requires Intrinsic Factor for absorption in the ileum.
II. Iron is best absorbed in its ferric (Fe3+) form.
III. Fats are absorbed into the lacteals (lymphatic vessels).
IV. Vitamin C inhibits the absorption of plant-based iron.
Which of the above statement(s) is/are correct?
(A) I and III only
(B) I, II, and III
(C) II and IV only
(D) I, III, and IV

81. Which of the following is the most appropriate reason for adding a small amount of fat or oil when consuming foods rich in beta-carotene (like carrots)?
(A) It neutralizes the naturally occurring sugars in carrots
(B) Oil acts as a preservative for carotene within the stomach
(C) Beta-carotene is fat-soluble and oil enhances its absorption
(D) Fat converts beta-carotene directly into metabolic energy

82. In modern nutrition missions, what is the primary significance of using digital tracking applications for health workers?
(A) Provide a real-time monitoring system for service delivery
(B) Track the current market prices of organic vegetables
(C) Count the daily calories burned by community health workers
(D) Track the real-time location of food grain delivery trucks

83. "Village Health, Sanitation and Nutrition Days" are organized regularly at the local level. Who among the following typically coordinates and leads these activities?
(A) Higher-ranking district administrative officers
(B) Judicial officers from the higher state courts
(C) The officially elected head of the village council
(D) Community health workers (ASHA, ANM, and AWW)

84. The term "Hidden Hunger" is frequently used in global nutrition discourse. What does it specifically refer to?
(A) A state where a person suppresses their appetite intentionally
(B) Severe protein-energy malnutrition like clinical Marasmus
(C) Vitamin and mineral deficiencies despite adequate calories
(D) Intermittent fasting practices used for weight management

85. The staple diet of some populations historically consisted predominantly of maize (corn) that wasn't properly treated. This diet was heavily linked to the outbreak of which deficiency disease?
(A) Scurvy
(B) Beriberi
(C) Pellagra
(D) Rickets

86. Frontline functionaries of child development schemes have several duties. Which of the following is not a regular duty of such a worker?
(A) Providing supplementary nutrition to children under 6 years
(B) Major surgical interventions for malnourished children
(C) Conducting growth monitoring by regularly weighing children
(D) Providing nutrition education to pregnant and nursing women

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87. How does the process of fermentation typically alter the nutritional profile of foods like idli or dosa batter?
(A) Significantly increases the total dietary fat content
(B) Enhances B-complex synthesis and improves digestibility
(C) Decreases the overall bioavailability of food proteins
(D) Completely eradicates all existing dietary fibre content

88. When a child with SAM is admitted to a rehabilitation centre, they are initially stabilized and fed a specialized therapeutic liquid feed. What is this feed commonly known as?
(A) Commercially fortified infant formula
(B) F-75 and F-100 therapeutic milk
(C) Diluted cow's milk with sugar
(D) Standard rice and dal gruel

89. Biological value (BV) is a measure of the proportion of absorbed protein from a food which becomes incorporated into the proteins of the organism's body. Which food typically has the highest biological value?
(A) Soybeans
(B) Whole Egg
(C) Lentils
(D) Wheat

90. Double fortified salt (DFS) is gaining prominence in public health nutrition programs. What two nutrients are added in DFS?
(A) Iodine and Iron
(B) Iodine and Calcium
(C) Iodine and Vitamin D
(D) Iron and Folic Acid

91. Which mineral plays a crucial role in maintaining fluid balance, transmitting nerve impulses, and is widely consumed in the form of common table salt?
(A) Calcium
(B) Sodium
(C) Magnesium
(D) Potassium

92. A sudden outbreak of lathyrism, characterized by spastic paralysis of lower limbs, is most likely traced back to the prolonged and excessive consumption of which specific pulse?
(A) Moong dal (Green gram)
(B) Toor dal (Pigeon pea)
(C) Khesari dal (Lathyrus sativus)
(D) Urad dal (Black gram)

93. According to standard public health definitions, an infant is classified as having Low Birth Weight (LBW) if their birth weight is strictly less than:
(A) 3.0 kg
(B) 2.5 kg
(C) 2.0 kg
(D) 1.5 kg

94. Read the given Assertion (A) and Reason (R) carefully and select the correct option.
Assertion (A): Exclusive breastfeeding is recommended for the first six months of an infant's life.
Reason (R): Breast milk contains all necessary nutrients, water, and vital antibodies required for optimal growth and immunity of the infant during this period.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

95. The concept of "Dietary Diversity" is promoted to combat malnutrition. What does this concept fundamentally entail?
(A) Consuming foods from various groups to ensure nutrient intake
(B) Eating large quantities of food from a single staple crop
(C) Frequently changing the sources from which food is bought
(D) Depending solely on imported exotic fruits and vegetables

96. Match the items in List I with those in List II.
List I: (Food Adulterant)
P. Water and starch
Q. Papaya seeds
R. Brick powder
S. Chalk powder
List II: (Target Food Item)
1. Chilli powder

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2. Milk
3. Sugar/Salt
4. Black pepper

(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-4, R-1, S-3
(C) P-3, Q-1, R-4, S-2
(D) P-4, Q-3, R-2, S-1

97. Overconsumption of sodium is a major dietary risk factor for which chronic non-communicable disease?
(A) Hypertension (High blood pressure)
(B) Hypotension
(C) Type-1 Diabetes
(D) Osteoarthritis

98. Under supplementary nutrition programs, the support provided to severely malnourished children (6 months to 3 years) aims to bridge a specific caloric deficit. How many kilocalories per day are mandated for such a child?
(A) 500 kcal
(B) 600 kcal
(C) 800 kcal
(D) 1000 kcal

99. What is the role of the 'Aflatoxin' contaminant in food safety?
(A) A beneficial probiotic added to yoghurts for gut health
(B) A synthetic preservative used in canned meats and poultry
(C) A harmless colourant used in various street food products
(D) A fungal toxin found on stored grains linked to liver cancer

100. Colostrum is the first milk produced by the mother immediately after delivery. Why is it considered highly essential for the newborn?
(A) It is exceptionally high in fats and provides massive energy
(B) It acts as a sedative to help the newborn sleep continuously
(C) It is the only natural source of Vitamin K for the infant
(D) It is rich in immunoglobulins and protects against infections

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ANSWERS

1. (D) Alanine
Essential amino acids cannot be synthesized by the body and must come from the diet. Non-essential amino acids, like alanine, are produced internally through metabolic processes. This specific amino acid is synthesized from pyruvate and plays a key role in the glucose-alanine cycle, helping transport nitrogen from muscles to the liver.

2. (C) Providing directly metabolizable caloric energy
Water is a vital inorganic nutrient that does not yield energy because it lacks carbon-hydrogen bonds found in macronutrients. Its primary physiological roles include acting as a universal solvent for chemical reactions, regulating core temperature via perspiration, and transporting nutrients to cells. Unlike carbohydrates or fats, it contains zero calories for metabolism.

3. (C) Macronutrients provide energy/structure; micronutrients regulate physiology
Macronutrients such as carbohydrates, proteins, and fats are required in large quantities to provide calories and structural building blocks for the body. Conversely, micronutrients like vitamins and minerals are needed in minute amounts to catalyze biochemical reactions and regulate physiological processes. This distinction is fundamental to understanding the varying quantitative requirements of human dietary intake.

4. (C) Folic Acid
Folic acid is a critical B-vitamin necessary for rapid cell division and the proper formation of the neural tube in early embryonic development. Supplementation before and during the first trimester significantly reduces the risk of congenital disabilities like spina bifida. It acts as a co-enzyme in DNA synthesis and amino acid metabolism during pregnancy.

5. (B) Ascorbic acid
Ascorbic acid is essential for the synthesis of collagen, a structural protein that maintains the integrity of connective tissues, blood vessels, and gums. A chronic deficiency leads to scurvy, characterized by fragile capillaries and impaired healing. Increasing intake of citrus fruits provides the necessary vitamin to reverse these clinical symptoms and restore healthy tissue function.

6. (A) I, II, and III
Kwashiorkor results from severe protein deficiency despite adequate energy intake, often manifesting as edema and a moon face. In contrast, marasmus is caused by an overall deficiency of both calories and protein, leading to extreme muscle wasting and loss of fat. These conditions represent different ends of the spectrum within protein-energy malnutrition occurring in children.

7. (B) The biological process of using food to sustain life functions
Nutrition encompasses the entire sequence of processes by which a living organism ingests, digests, absorbs, and utilizes food substances. This biological mechanism is essential for maintaining growth, repairing damaged tissues, and providing the energy necessary for all physiological activities. It represents the functional relationship between the food consumed and the maintenance of health and well-being.

8. (B) Beriberi
Thiamine is a water-soluble vitamin that acts as a co-factor in carbohydrate metabolism and nerve function. Its deficiency leads to beriberi, which can affect the cardiovascular or nervous systems. Symptoms often include muscle weakness, swelling, and irregular heart rhythms. This condition is historically linked to diets consisting primarily of polished rice lacking the essential thiamine-rich outer bran.

9. (A) 2, 3, 1, 4
Fat digestion begins with the emulsification of large fat globules into smaller droplets by bile salts. Pancreatic lipase then acts on these droplets to break them down into fatty acids and

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monoglycerides. These products form micelles, which transport lipids to the intestinal surface. Finally, the lipid components are absorbed into the intestinal epithelial cells for transport.

10. (C) Elevated Low-Density Lipoprotein (LDL) levels and increased risk of heart disease
Trans fats are unsaturated fats produced through industrial hydrogenation that adversely affect blood lipid profiles. They significantly increase low-density lipoprotein cholesterol while simultaneously lowering high-density lipoprotein levels. This imbalance promotes arterial plaque buildup and atherosclerosis, substantially raising the risk of developing cardiovascular diseases. Limiting these fats is a key recommendation for maintaining long-term heart and vascular health.

11. (D) Lack of Vitamin A prevents rhodopsin synthesis in the rod cells
Vitamin A is a precursor for retinal, which combines with the protein opsin to form rhodopsin, the primary light-sensitive pigment in retinal rod cells. Rhodopsin is essential for vision in low-light conditions. When levels are insufficient, the regeneration of this pigment is impaired, leading to night blindness. This ocular manifestation is a classic early indicator of nutritional deficiency.

12. (C) P-3, Q-4, R-1, S-2
Glucose serves as the fundamental fuel for cellular energy production via aerobic and anaerobic respiration. Amino acids are the building blocks for protein synthesis, facilitating tissue growth and enzyme formation. Triglycerides provide a concentrated energy reservoir and thermal insulation. Dietary fiber adds bulk to stool, ensuring smooth bowel movements and preventing constipation by regulating the transit of intestinal contents.

13. (A) Synthesis of thyroxine and triiodothyronine
Iodine is a trace element sequestered by the thyroid gland to produce hormones that regulate the metabolic rate of every cell in the body. These thyroid hormones are crucial for normal physical growth and brain development, particularly during fetal life and childhood. Insufficient iodine intake leads to goiter and various developmental disorders known collectively as iodine deficiency disorders.

14. (C) They require bile salts for efficient absorption in the small intestine
Water-soluble vitamins, including the B-complex group and Vitamin C, are absorbed directly into the bloodstream without needing lipids or bile salts. Unlike fat-soluble vitamins, they are generally not stored in large quantities and are excreted through the urine when consumed in excess. Therefore, they must be regularly replenished through the daily diet to maintain optimal physiological functions.

15. (D) Bone mineral density scan
Standard child growth monitoring utilizes simple anthropometric measurements to assess nutritional status over time. Parameters like weight-for-age, height-for-age, and mid-upper arm circumference are used to identify stunting, wasting, or underweight conditions. Clinical bone scans are specialized diagnostic tools for bone disease and are not part of routine community-based nutrition assessments used for monitoring healthy development in general populations.

16. (A) Regulatory foods: Dietary fibre and sugars
Regulatory foods primarily consist of vitamins and minerals that control physiological processes and maintain health. While dietary fiber aids digestion, sugars are energy-yielding carbohydrates rather than regulatory nutrients. Body-building foods include proteins for tissue repair, and protective foods provide micronutrients to ward off disease. Classification based on function helps in planning balanced diets for various nutritional and health-related requirements.

17. (A) Frequency of dietary fibre intake
Basal metabolic rate is primarily influenced by physiological factors like age, gender, and the proportion of lean body mass. Muscles consume more energy at rest than fat tissue, making lean mass a significant determinant of BMR. While dietary fiber is important for digestive health and satiety, its frequency of intake does not directly alter the baseline metabolic energy expenditure.

18. (A) They maintain cell membrane integrity and assist in synthesizing prostaglandins
Essential fatty acids like alpha-linolenic acid and linoleic acid are vital components of phospholipids that form cellular membranes.

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They ensure fluidity and functional signaling within cells throughout the body. Additionally, they serve as precursors for eicosanoids and prostaglandins, which regulate inflammatory responses and blood clotting. Since the body cannot synthesize them, they must be obtained through specific dietary sources.

19. (A) Thirst sensation, decreased urine output, rapid heart rate, confusion
As the body loses water, the initial physiological trigger is the thirst sensation to encourage fluid intake. To conserve remaining water, the kidneys reduce urine volume. If the deficit increases, blood volume drops, leading to a compensatory rapid heart rate to maintain circulation. Severe dehydration eventually impairs brain function, causing cognitive symptoms like confusion, lethargy, and eventually loss of consciousness.

20. (A) Both A and R are true and R is the correct explanation of A.
Vitamin D is converted into its active form, calcitriol, which acts on the intestinal lining to facilitate calcium uptake. It specifically promotes the transcription and synthesis of calbindin, a protein that transports calcium across the epithelial cells into the blood. Without adequate Vitamin D, dietary calcium remains largely unabsorbed, leading to bone mineralization issues despite a high mineral intake.

21. (C) Kwashiorkor
The presence of edema, indicated by a distended abdomen, combined with reddish hair and thin limbs, is characteristic of Kwashiorkor. This condition occurs when a diet is calorie-sufficient but severely protein-deficient, often seen in children transitioning from breast milk to low-protein starch gruels. The low blood protein levels cause fluid to leak into tissues, resulting in the distinctive puffy appearance.

22. (B) Severe protein deficiency causes fluid retention and edema by reducing blood osmotic pressure
Albumin is the primary protein in blood plasma that maintains oncotic pressure, keeping fluid within the circulatory system. When dietary protein is severely lacking, albumin production drops, leading to a decrease in osmotic pressure. This causes fluid to shift from the blood vessels into the surrounding interstitial spaces, manifesting as bilateral pitting edema, a hallmark sign of clinical protein deficiency.

23. (D) Zinc
Zinc is an essential trace element required for the activity of over three hundred enzymes, including superoxide dismutase, which protects cells from oxidative damage. It plays a critical role in immune cell development and function, DNA synthesis, and protein production. Chronic zinc deficiency can lead to impaired growth, delayed wound healing, and increased susceptibility to infectious diseases in vulnerable populations.

24. (D) 50-60% Carbohydrates, 10-15% Proteins, 20-30% Fats
General dietary guidelines recommend that more than half of daily calories should come from carbohydrates to provide readily available energy. Proteins should contribute a smaller portion primarily for tissue repair and maintenance. Fats are necessary for fat-soluble vitamin absorption and hormonal health, but intake should be moderated. This distribution ensures a balanced intake of energy and essential nutrients for most healthy individuals.

25. (B) Heme iron from plants is more easily absorbed than non-heme iron
Iron exists in two dietary forms: heme and non-heme. Heme iron is found exclusively in animal tissues and is absorbed more efficiently by the human gut. Non-heme iron, found in plant sources like spinach and grains, has a lower bioavailability. Vitamin C can enhance the absorption of non-heme iron, while various plant components like phytates can inhibit it, making source selection important.

26. (C) Statement I is correct but Statement II is incorrect
Glucose is the preferred energy substrate for the brain, which relies on a constant supply from the blood. While plants store excess carbohydrates as starch, the human body stores them in the form of glycogen. Glycogen is primarily sequestered in the liver and skeletal muscles, where it can be rapidly broken down into glucose when energy demands increase or blood sugar levels drop.

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27. (D) Statement I is incorrect but Statement II is correct
Lactating women have higher energy demands than pregnant women because milk production is an energetically expensive physiological process. Additional calories are required to maintain milk volume and quality. Furthermore, calcium requirements increase significantly during lactation to ensure sufficient mineral content in the breast milk without depleting the mother's own bone stores. Adequate nutrition is vital for both maternal health and infant growth.

28. (A) I and II only
Vitamins are classified based on their solubility in either fats or water. Vitamin A is fat-soluble and vital for maintaining healthy vision and immune function. Vitamin C is water-soluble and acts as an antioxidant while facilitating collagen synthesis. However, Vitamin K is actually fat-soluble, not water-soluble, and is essential for the synthesis of proteins required for blood coagulation and bone metabolism.

29. (C) It cannot be broken down by human digestive enzymes
Dietary fiber consists of complex plant-derived carbohydrates, such as cellulose and lignin, that resist digestion in the human small intestine. Unlike starch, which is hydrolyzed into glucose, fiber reaches the large intestine mostly intact. It adds bulk to the diet, slows the absorption of sugars, and promotes healthy gut microflora fermentation. This unique property makes it essential for preventing digestive disorders and constipation.

30. (D) Vitamin E - Vegetable oils and nuts
Vitamin E is a fat-soluble antioxidant that protects cell membranes from oxidative stress. Its richest dietary sources are vegetable oils, such as sunflower and wheat germ oil, as well as nuts and seeds. While Vitamin D is synthesized via sunlight or found in fatty fish, and Vitamin K is in leafy greens, Vitamin E is primarily associated with lipid-rich plant foods.

31. (C) 30.0 and above
The Body Mass Index is a standard screening tool that relates weight to height to categorize nutritional status. A BMI between 18.5 and 24.9 is considered normal, while values from 25.0 to 29.9 indicate overweight status. A value of 30.0 or higher is medically classified as obesity, which is associated with increased risks of chronic diseases like diabetes and heart conditions.

32. (B) Epidemic Dropsy
Argemone oil contains toxic alkaloids like sanguinarine, which can cause serious health issues when consumed. Adulteration of edible mustard oil with argemone seeds leads to epidemic dropsy, a condition characterized by sudden swelling of the limbs, cardiovascular distress, and potential glaucoma. This is a significant public health concern requiring strict food safety regulations to prevent accidental or intentional poisoning in the population.

33. (B) Cretinism
Maternal iodine deficiency during pregnancy severely impairs the development of the fetal thyroid and brain. This leads to cretinism, a condition marked by permanent stunted physical growth, mental retardation, and deafness or mutism. Because the damage occurs during a critical window of neurological development, it is irreversible. Salt iodization is a primary global strategy used to prevent this devastating but avoidable nutritional disorder.

34. (D) P-3, Q-4, R-1, S-2
Lycopene is a potent antioxidant pigment found in tomatoes, linked to reduced risk of chronic diseases. Green tea is rich in catechins, which provide various health benefits through their anti-inflammatory properties. Turmeric contains curcumin, the active compound responsible for its bright yellow color and medicinal effects. Garlic provides allicin, a sulfur-containing molecule known for its antimicrobial properties and cardiovascular health benefits.

35. (B) I, II, III, and IV
Comprehensive child development services typically provide a package of six services: supplementary nutrition, immunization, health check-ups, referral services, pre-school non-formal education, and nutrition/health education. These are designed to address the holistic needs of children and mothers at the community level. Tertiary hospital care and complex surgeries are specialized medical interventions and do not fall

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under the routine services of these community-based schemes.

36. (A) Deactivate enzymes causing loss of flavour, colour, and texture
Blanching involves briefly immersing vegetables in boiling water or steam followed by rapid cooling. The main purpose is to stop the activity of natural enzymes that would otherwise cause spoilage and nutrient loss during storage. This process helps preserve the vibrant color, crisp texture, and nutritional value of the food. It also cleanses the surface and softens the tissue for further processing.

37. (A) Keratomalacia
Xerophthalmia represents a range of eye conditions caused by severe Vitamin A deficiency. It begins with night blindness and conjunctival xerosis. If untreated, it progresses to Bitot's spots and eventually keratomalacia, which involves the liquefaction and irreversible destruction of the cornea. This advanced stage often results in permanent blindness, making early intervention and Vitamin A supplementation crucial for preventing childhood vision loss.

38. (D) Rice: Rs. 3 per kg
Under national food security laws, the government provides subsidized food grains to eligible households through the public distribution system. To ensure affordability, prices are fixed at heavily discounted rates. Standard central issue prices for these essential commodities are set at three rupees per kilogram for rice, two rupees for wheat, and one rupee for coarse grains. This structure aims to eliminate hunger.

39. (D) Food grown without synthetic pesticides or chemical fertilizers
Organic food refers to agricultural products grown using farming practices that exclude the use of synthetic fertilizers, chemical pesticides, and genetically modified organisms. These methods focus on ecological balance and the preservation of soil health through natural processes like crop rotation and composting. Organic certification ensures that the food has been produced according to specific environmental and animal welfare standards.

40. (D) Wasting
Wasting is a clinical indicator of acute malnutrition, defined as having a low weight-for-height ratio. It indicates a recent and severe process of weight loss, often associated with acute starvation or severe illness. Unlike chronic conditions that affect height, wasting can change rapidly and is a strong predictor of mortality in children. It requires immediate nutritional and medical intervention to prevent serious outcomes.

41. (B) Foodborne illnesses like gastroenteritis and typhoid
Street food prepared in unhygienic conditions often becomes a vehicle for pathogenic bacteria, viruses, and parasites. Contamination usually occurs due to poor water quality, inadequate handwashing, or improper storage temperatures. Consuming such food leads to acute foodborne illnesses, which manifest as abdominal pain, vomiting, and diarrhea. These infections, like typhoid or gastroenteritis, are the most immediate and common risks associated with unregulated vendors.

42. (C) P-3, Q-1, R-4, S-2
Stunting is measured as low height-for-age, reflecting chronic, long-term nutritional deficiencies. Wasting refers to low weight-for-height, indicating acute, recent weight loss. Underweight is a general indicator of low weight-for-age, which can be caused by both stunting and wasting. Conversely, overweight is defined by a high weight-for-height ratio, signaling excessive body fat accumulation. These anthropometric measurements are vital for assessing community health.

43. (A) Procurement by central agency → Storage → Allocation to States → Distribution via Fair Price Shops
National food security follows a systematic logistics chain to reach beneficiaries. First, central agencies procure surplus grains from farmers at guaranteed prices. The grains are then safely stored in large warehouses to maintain quality. Subsequently, the central government allocates specific quotas to various states based on demand. Finally, the food is distributed to citizens through a network of local fair price shops.

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44. (D) 450 calories and 12 grams of protein
School meal programs are designed to provide a significant portion of a child's daily nutritional requirements. For primary students in classes one to five, the mandated minimum standard is four hundred and fifty calories and twelve grams of protein per meal. These norms ensure that children receive the energy and nutrients necessary for growth and concentration during the school day, particularly in underserved regions.

45. (C) Vitamin C
Vitamin C, also known as ascorbic acid, is the most chemically unstable and heat-sensitive vitamin. It is easily oxidized and destroyed by high temperatures, prolonged cooking times, and exposure to air. Boiling vegetables for an extended period causes a significant loss of this nutrient, as it leaches into the water and breaks down under heat. Steaming or shorter cooking methods help preserve it.

46. (B) Weekly Iron and Folic Acid Supplementation (WIFS)
Iron deficiency anemia is a major public health challenge, especially among adolescents and women of reproductive age. A primary preventive strategy involves the weekly administration of iron and folic acid supplements. This periodic dosing helps build iron stores and prevents the development of anemia. Such programs are often implemented through schools and community centers to ensure wide coverage and improve overall population health.

47. (B) Bioactive components providing health benefits beyond basic nutrition
Functional foods are those that contain specific bioactive compounds, such as probiotics, fiber, or antioxidants, which offer physiological benefits beyond meeting basic caloric needs. These foods may reduce the risk of chronic diseases or enhance specific bodily functions like gut health or immunity. Examples include fortified cereals, fermented milks, and oats. They represent an intersection between conventional diet and targeted health-promoting nutrition.

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48. (B) Lack of food security, seasonal migration, and poor maternal health
Malnutrition in many regions is deeply rooted in complex socio-economic issues. Inadequate access to affordable, diverse food sources creates chronic food insecurity. Furthermore, seasonal migration often disrupts regular feeding and healthcare access for young children. When combined with poor maternal health and lack of education, these factors create a cycle of undernutrition that is difficult to break without comprehensive social and economic interventions.

49. (A) Turmeric powder (Haldi)
Metanil yellow is an unpermitted industrial dye frequently used to adulterate turmeric powder to give it a bright, appealing yellow color. Consumption of this chemical is hazardous as it can cause neurotoxicity and gastrointestinal distress. It is a common target of food safety testing because it masks the use of low-quality or filler materials in ground spices, compromising the purity of food.

50. (C) Leakages, inclusion/exclusion errors, and logistical challenges
While the Public Distribution System is vital for food security, it faces several systemic hurdles in rural areas. Significant amounts of grain can be lost through leakages or theft during transport and storage. Additionally, identifying the correct beneficiaries is difficult, leading to the exclusion of deserving families or the inclusion of ineligible ones. Poor infrastructure and transportation further complicate the timely delivery of goods.

51. (D) Vitamin C and B-complex vitamins increase significantly
Sprouting is a natural process that activates dormant enzymes within pulse seeds. This metabolic activity leads to a dramatic increase in the concentration of Vitamin C and various B-complex vitamins. Additionally, sprouting reduces anti-nutritional factors like phytic acid, thereby improving the bioavailability of minerals such as iron and calcium. It also breaks down complex proteins into simpler forms, making the pulses easier to digest.

52. (D) Undernutrition, overnutrition, and micronutrient imbalances
Malnutrition is a comprehensive term that describes any condition resulting from an incorrect intake of nutrients. This includes undernutrition, which encompasses wasting, stunting, and being underweight. It also includes micronutrient deficiencies, often called hidden hunger. Furthermore, overnutrition, leading to overweight and obesity, is a form of malnutrition. All these states represent a significant departure from the optimal balance required for healthy physiological function.

53. (C) They exclusively target urban metropolitan areas to reduce childhood obesity
National nutrition missions are broad-based initiatives designed to address the multiple facets of malnutrition across entire countries. They specifically target high-risk groups like children and pregnant women to reduce stunting, anemia, and low birth weights. These programs are not limited to urban centers but operate extensively in rural and tribal regions through community-based health networks. Their focus is comprehensive, addressing both undernutrition and micronutrient needs.

54. (C) Increased dependency on synthetic fertilizers
Organic farming aims to create a sustainable agricultural system that works with natural processes. One of its defining characteristics is the complete avoidance of synthetic fertilizers and chemical pesticides. By using natural alternatives like compost and manure, it protects soil biodiversity and reduces the risk of chemical contamination in groundwater. Therefore, increased dependency on synthetic chemicals is the opposite of organic farming's fundamental principles and goals.

55. (A) Both Statement I and Statement II are correct
The Antyodaya Anna Yojana is a social welfare program specifically designed to support the most impoverished families in the country. It identifies the poorest households and provides them with highly subsidized food grains to ensure their basic survival. Currently, each eligible household is entitled to receive thirty-five kilograms of grain every month. This targeted approach is a cornerstone of the national effort to eliminate extreme hunger.

56. (A) Osteomalacia
In adults, a severe deficiency of Vitamin D leads to a condition called osteomalacia. This disorder involves a failure to properly mineralize the newly formed bone matrix, making the bones soft and prone to bending. Affected individuals often experience persistent bone pain, muscle weakness, and an increased risk of fractures. While rickets is the childhood equivalent, osteomalacia specifically refers to this skeletal pathology in the mature adult skeleton.

57. (A) They are live beneficial bacteria that improve gut flora health
Probiotics are live microorganisms that provide health benefits to the host when consumed in adequate amounts. They primarily function in the gastrointestinal tract to maintain a healthy balance of gut microbiota. By competing with harmful pathogens and assisting in nutrient breakdown, they support digestion and enhance immune function. Common sources include fermented foods like yogurt, kefir, and certain types of dietary supplements used for gut restoration.

58. (A) It is a measure of chronic malnutrition resulting in low height-for-age
Stunting is a clinical indicator of chronic undernutrition, defined by a height-for-age ratio that is significantly below average. It reflects long-term cumulative effects of poor diet and frequent infections during the critical early years of life. Unlike wasting, stunting is a gradual process and is often difficult to reverse quickly. It has long-lasting implications for a child's cognitive development and future physical health and productivity.

59. (C) Ministry of Health and Family Welfare
The Food Safety and Standards Authority of India is the statutory body responsible for regulating food quality and safety across the nation. It sets scientifically-based standards for food products and monitors their compliance. Although food involves agriculture and processing, the FSSAI is administratively under the Ministry of Health and Family Welfare. This reflects the government's priority of viewing food safety as a fundamental component of public health and consumer protection.

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60. (B) Improve enrollment, retention, and attendance
Beyond addressing hunger, school-based meal programs serve as a powerful incentive for families to send their children to school. By providing a nutritious meal, these programs directly improve student enrollment and daily attendance rates. They also help in the retention of students from economically disadvantaged backgrounds who might otherwise drop out. Furthermore, a well-fed child can concentrate better, which enhances learning outcomes and overall educational attainment.

61. (B) From conception through the child's second birthday
The first one thousand days represent a unique window of opportunity when the foundations for optimum health and brain development are established. This period spans approximately two hundred and seventy days of pregnancy and the first seven hundred and thirty days after birth. Adequate nutrition during this time is critical to prevent irreversible damage such as stunting and cognitive deficits, which can impact the child's entire adult life.

62. (A) Liver and Skeletal Muscles
Glycogen is the multibranched polysaccharide that serves as the main form of energy storage in animals. In the human body, it is stored in two primary locations. The liver stores glycogen to maintain blood glucose levels for use by the entire body, especially the brain. Skeletal muscles store a larger total amount of glycogen, which is used locally as an immediate energy source during intense physical activity.

63. (A) Administering Vitamin A and IFA to children and mothers
Auxiliary Nurse Midwives are frontline health workers who provide essential maternal and child health services in rural areas. Their nutritional duties include the distribution and administration of Vitamin A supplements to prevent blindness and Iron-Folic Acid tablets to combat anemia. They also monitor the health of pregnant women and young children, providing guidance on breastfeeding and proper complementary feeding to ensure healthy growth within the local community.

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64. (C) It binds minerals like iron and zinc, reducing absorption
Phytic acid is an antioxidant found in many plant foods like whole grains, legumes, and nuts. However, it is considered an anti-nutrient because it has a strong affinity for binding with essential minerals in the digestive tract. By forming insoluble complexes with iron, calcium, and zinc, it significantly reduces their bioavailability for absorption into the bloodstream. Methods like soaking, fermenting, or sprouting can help break down phytates.

65. (A) The food is fortified with essential micronutrients
The '+F' logo is a standardized symbol used to identify food products that have been fortified with essential vitamins and minerals. Fortification is the process of adding micronutrients to staple foods during processing to improve their nutritional quality. Common examples include salt fortified with iodine, or milk and oils enriched with Vitamins A and D. This logo helps consumers make informed choices to prevent common nutritional deficiencies in their diet.

66. (A) 1, 2, 3
The loss of water-soluble vitamins is greatest during prolonged boiling because the heat destroys the nutrients and they leach into the cooking water. Steaming is gentler, as the food does not directly touch the water, resulting in better retention. Microwaving is often the most efficient method due to shorter cooking times and minimal water use. Therefore, boiling causes the most loss, followed by steaming, then microwaving.

67. (C) Clean Street Food Hub
The Clean Street Food Hub is an initiative launched by the food safety regulator to improve the hygiene standards of street food clusters. It focuses on training vendors in safe food handling, waste management, and the use of clean water. Areas that meet these stringent safety criteria are certified, providing consumers with assurance about the quality of the food. This program aims to transform the popular street food culture into a safe experience.

68. (B) Niacin (B3)
Pellagra is a disease caused by a severe deficiency of niacin or its precursor, the amino acid tryptophan. It historically affected populations relying on corn as a staple without proper processing. The condition is classically defined by the "four Ds": dermatitis on sun-exposed skin, persistent diarrhea, dementia or mental confusion, and eventually death if left untreated. Niacin is essential for cellular energy metabolism and DNA repair across all tissues.

69. (A) I, II, III, and IV
Iron deficiency anemia presents with several clinical signs. Low hemoglobin leads to pale skin and fatigue due to reduced oxygen transport. Chronic deficiency can cause koilonychia, where the nails become thin and concave. Another common symptom is pica, the abnormal craving for non-nutritive substances. While a swollen thyroid is a sign of iodine deficiency, the other listed symptoms are classic indicators that help clinicians diagnose an insufficient iron status in patients.

70. (C) Nutritional Rehabilitation Centres (NRC)
Nutritional Rehabilitation Centres are specialized facility-based units established to treat children suffering from severe acute malnutrition with medical complications. At these centers, children receive intensive therapeutic feeding and medical care to stabilize their condition. Mothers are also trained on proper feeding practices and hygiene to prevent relapse after discharge. This targeted intervention is critical for reducing child mortality rates associated with the most severe forms of malnutrition in the community.

71. (A) Low Birth Weight (LBW) infant
Maternal weight gain during pregnancy is a critical indicator of fetal growth and development. Insufficient weight gain suggests that the fetus is not receiving adequate nutrients for optimal growth, which significantly increases the risk of delivering a low birth weight infant. LBW babies are more vulnerable to infections and developmental delays. Therefore, monitoring weight and ensuring adequate caloric and nutrient intake for the mother is essential for a healthy birth outcome.

72. (B) Pregnant women, lactating mothers, and young children
Take Home Ration is a nutrition support initiative where fortified food mixes are provided to specific vulnerable groups through local community centers. The primary targets are pregnant women, breastfeeding mothers, and children between six months and three years of age. These rations are intended to supplement the daily diet and bridge the nutritional gap during these critical stages of life. They are especially important for populations where access to diverse, nutritious food is limited.

73. (D) Glucose
Carbohydrates are classified by their chemical structure into simple and complex forms. Monosaccharides are the simplest sugars that cannot be hydrolyzed further. Glucose is the most abundant monosaccharide and serves as the primary energy source for cellular metabolism in the human body. Other sugars like sucrose and lactose are disaccharides consisting of two units, while starch is a large polysaccharide. Glucose is absorbed directly into the bloodstream during the digestion process.

74. (C) Common salt
Salt iodization is a highly effective public health strategy for preventing iodine deficiency disorders, including goiter. Common table salt is used as the vehicle because it is consumed in small, consistent amounts by almost everyone regardless of socioeconomic status. This simple fortification process ensures that individuals receive the trace amount of iodine required for thyroid hormone synthesis. It has been a successful global intervention for reducing the prevalence of preventable mental and physical disabilities.

75. (D) Vitamin A and D
Public health guidelines often mandate the fortification of milk and edible oils with Vitamins A and D because these are fat-soluble vitamins that are stable in lipid-based vehicles. Vitamin A is essential for vision and immunity, while Vitamin D is crucial for bone health and calcium absorption. Since these nutrients are frequently deficient in many diets, adding them to widely consumed staples is a cost-effective way

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to improve the nutritional status of the general population.

76. (C) III only
A balanced diet must include all macronutrients and micronutrients in appropriate proportions to sustain health. While excessive fat intake is discouraged, complete exclusion of dietary fats is incorrect and harmful. Fats are essential for absorbing fat-soluble vitamins, providing essential fatty acids, and maintaining cell membrane structure. A healthy diet should manage the type and quantity of fats rather than eliminating them entirely. Providing sufficient energy and protein remains a core component of nutritional balance.

77. (D) Antidiuretic Hormone (ADH)
Antidiuretic hormone, also known as vasopressin, is produced by the hypothalamus and released by the pituitary gland to regulate water balance. When the body is dehydrated, ADH levels increase, signaling the kidneys to reabsorb more water back into the bloodstream, thereby reducing urine volume. If the body is overhydrated, ADH levels drop, allowing the kidneys to excrete more water. This negative feedback mechanism is essential for maintaining proper blood pressure and osmotic balance.

78. (D) P-2, Q-1, R-4, S-3
Dastak Abhiyan is a door-to-door screening campaign to identify children with severe acute malnutrition. The Atal Bihari Vajpayee Mission focuses on the broader goal of eradicating child malnutrition. Lado Abhiyan is a social initiative aimed at the eradication of child marriage. Finally, the Annapurna Scheme provides food security specifically for senior citizens who are not covered under other pension programs. These diverse schemes address different social and nutritional challenges within the population.

79. (B) Cholesterol is found abundantly in all plant oils
Cholesterol is a waxy, fat-like substance that is essential for cell membranes and hormone production, but it is found exclusively in animal-based products. Plant oils, such as olive, sunflower, or coconut oil, are naturally cholesterol-free. Instead, plants contain phytosterols, which can actually help lower human cholesterol levels. While fats provide high energy density and require bile for digestion, the statement that cholesterol is abundant in plant oils is factually incorrect in human nutrition.

80. (A) I and III only
Vitamin B12 absorption requires intrinsic factor, a protein secreted by the stomach, to be successfully taken up in the ileum. Dietary fats are processed into chylomicrons and absorbed into the lymphatic vessels, known as lacteals, rather than directly into the blood. In contrast, iron is best absorbed in its ferrous form rather than ferric. Also, Vitamin C actually enhances, rather than inhibits, the absorption of non-heme iron from plant sources, making those statements incorrect.

81. (C) Beta-carotene is fat-soluble and oil enhances its absorption
Beta-carotene is a provitamin found in many orange and yellow vegetables that the body converts into Vitamin A. Because it is a fat-soluble compound, its absorption from the digestive tract into the bloodstream is significantly more efficient when consumed with a small amount of dietary fat. The presence of oil stimulates the release of bile and the formation of micelles, which are necessary for transporting these lipid-soluble nutrients across the intestinal wall for utilization.

82. (A) Provide a real-time monitoring system for service delivery
Modern nutrition programs use digital applications to streamline the reporting and tracking of health interventions. These tools allow community workers to record measurements, supplement distribution, and health check-ups in real-time. This data provides supervisors with immediate feedback on the progress of various schemes and helps identify areas where service delivery may be lagging. It enhances accountability and ensures that vulnerable populations receive the necessary nutritional support consistently and efficiently according to the mandated guidelines.

83. (D) Community health workers (ASHA, ANM, and AWW)
Village Health, Sanitation and Nutrition Days are community-level events designed to bring

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essential services directly to the people. These days are coordinated by a team of frontline workers: the Accredited Social Health Activist, the Auxiliary Nurse Midwife, and the Anganwadi Worker. Together, they provide immunizations, health check-ups, and nutrition counseling to women and children. This collaborative approach ensures that the most vulnerable community members have regular access to preventive healthcare and vital nutritional information.

84. (C) Vitamin and mineral deficiencies despite adequate calories
Hidden hunger refers to a form of malnutrition where an individual consumes enough calories to satisfy their appetite but lacks essential micronutrients like iron, iodine, and vitamins. Because the physical signs of these deficiencies are not always immediately visible, the condition can go unnoticed for long periods. However, it can lead to serious health consequences, including impaired immunity, reduced cognitive function, and poor physical development. It is a major challenge in populations with low dietary diversity.

85. (C) Pellagra
Pellagra is historically linked to diets heavily dependent on maize that has not undergone nixtamalization, a traditional soaking process in an alkaline solution. Maize is low in available niacin and the essential amino acid tryptophan. Without proper treatment, the niacin in corn remains bound and unabsorbable by the human gut. This lead to widespread outbreaks of the disease among populations whose diet lacked variety and included little animal protein or other sources of these vital nutrients.

86. (B) Major surgical interventions for malnourished children
Community-based child development workers are tasked with preventive and promotive health activities. Their regular duties include providing supplementary meals, monitoring child growth through regular weighing, and educating mothers on nutrition and hygiene. They are also trained to identify signs of severe malnutrition and refer sick children to higher medical facilities. However, they are not medical doctors or surgeons, and performing complex surgical interventions is entirely outside their scope of work and professional training.

87. (B) Enhances B-complex synthesis and improves digestibility
Fermentation is a biological process where microorganisms like bacteria and yeast break down complex carbohydrates in food. In batters for idli or dosa, this process significantly increases the levels of B-complex vitamins, especially thiamine, riboflavin, and niacin. It also breaks down anti-nutrients and complex proteins, making the final product much easier to digest and improving the overall bioavailability of minerals. This traditional processing method substantially enhances the nutritional quality of these common staple foods.

88. (B) F-75 and F-100 therapeutic milk
Children with severe acute malnutrition require a carefully managed feeding protocol to avoid refeeding syndrome. In rehabilitation centers, they are started on F-75, a low-protein therapeutic milk designed for the initial stabilization phase. Once their appetite returns and complications are managed, they transition to F-100, which has higher energy and protein content to promote rapid catch-up growth. these specialized formulas are essential for the safe recovery of children from life-threatening stages of extreme undernutrition.

89. (B) Whole Egg
Biological value is a measure used to determine how efficiently the body can utilize the protein from a specific food source. A high value indicates that the food provides a complete profile of essential amino acids in proportions that closely match human requirements. The whole egg is considered the gold standard in nutrition with a biological value of nearly one hundred. While soy and lentils are good plant proteins, they often lack certain amino acids compared to eggs.

90. (A) Iodine and Iron
Double fortified salt is an innovative public health tool designed to simultaneously address two major micronutrient deficiencies: iodine and iron. By adding both nutrients to common table salt, the intervention helps prevent both goiter and iron deficiency anemia across the entire population. This technology requires careful

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formulation to ensure that the iron remains stable and does not react with the iodine. Using DFS is a cost-effective strategy to improve the health and cognitive potential of the community.

91. (B) Sodium
Sodium is a major extracellular cation that plays a fundamental role in maintaining the body's fluid balance and osmotic pressure. It is also essential for the transmission of nerve impulses and the contraction of muscle fibers. While it is naturally present in many foods, the primary source in the modern diet is sodium chloride, or common table salt. Although vital for health, its intake must be carefully monitored as excessive consumption is linked to increased blood pressure.

92. (C) Khesari dal (Lathyrus sativus))
Lathyrism is a neurological disease caused by the prolonged consumption of Khesari dal, which contains a neurotoxin called BOAA. This toxin affects the spinal cord, leading to spastic paralysis of the lower limbs. The pulse is hardy and often grows in drought conditions when other crops fail, making it a "famine food" for poor populations. Education and limiting its intake are essential to prevent this irreversible condition, which significantly impacts the mobility and quality of life.

93. (B) 2.5 kg
According to the World Health Organization, an infant is classified as having low birth weight if they weigh less than two thousand five hundred grams at the time of birth, regardless of gestational age. This measurement is a critical indicator of the infant's health status and the mother's nutritional history during pregnancy. LBW infants are at a higher risk for neonatal mortality, developmental delays, and chronic health issues in adulthood, making prenatal care and nutrition vital.

94. (A) Both A and R are true and R is the correct explanation of A.
Exclusive breastfeeding for the first six months is a cornerstone of infant health. Breast milk is uniquely formulated to provide the perfect balance of fats, proteins, and carbohydrates for a growing baby. More importantly, it contains maternal antibodies and immunoglobulins that provide essential protection against common childhood infections like diarrhea and pneumonia. It also ensures the infant receives enough water for hydration. This natural nutrition source cannot be fully replicated by any commercial infant formula product.

95. (A) Consuming foods from various groups to ensure nutrient intake
Dietary diversity refers to the practice of eating a wide variety of foods from different groups, such as fruits, vegetables, grains, proteins, and dairy. This approach is fundamental to ensuring that the body receives all the different vitamins, minerals, and macronutrients required for optimal health. Relying on a single staple crop often leads to micronutrient deficiencies. Increasing diversity in the daily diet is a key strategy for combating hidden hunger and improving the overall nutritional status.

96. (B) P-2, Q-4, R-1, S-3
Common food adulteration involves adding cheaper or harmful substances to staples for profit. Milk is often diluted with water or thickened with starch. Black pepper can be mixed with dried papaya seeds, which look similar. Chili powder is frequently adulterated with brick powder to add weight and maintain color. Sugar and salt may contain chalk powder as a filler. These practices compromise food safety and can pose serious health risks to unsuspecting consumers.

97. (A) Hypertension (High blood pressure)
High sodium intake is a well-established dietary risk factor for the development of hypertension. Excess sodium in the bloodstream pulls water into the blood vessels, increasing the total volume of blood and the pressure against the arterial walls. Over time, this chronic high pressure can damage the cardiovascular system and kidneys. Reducing salt consumption is a primary public health recommendation for preventing heart disease and strokes, which are major non-communicable health challenges in many modern societies today.

98. (C) 800 kcal
Supplementary nutrition programs are designed to provide extra energy to children who are identified as severely malnourished. For children aged six months to three years who fall into this category, the government mandated guidelines

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specify the provision of eight hundred kilocalories per day. This amount is calculated to bridge the significant caloric gap and support rapid weight gain and recovery. This targeted supplemental feeding is a vital part of the community-based management of severe acute malnutrition.

99. (D) Aflatoxin
Aflatoxins are a group of toxic metabolites produced by certain molds, such as Aspergillus flavus, that grow on agricultural crops. They are frequently found on improperly stored grains, peanuts, and maize, especially in warm and humid conditions. Consumption of contaminated food is a major safety concern because aflatoxins are potent carcinogens strongly linked to the development of liver cancer. Strict monitoring of moisture levels and storage conditions is necessary to prevent fungal growth and protect the food supply.

100. (D) It is rich in immunoglobulins and protects against infections
Colostrum is the thick, yellowish fluid produced by the mammary glands during the final stage of pregnancy and the first few days after birth. It is uniquely rich in antibodies, specifically immunoglobulin A, which coats the infant's digestive tract to prevent the entry of pathogens. It acts as the newborn's first natural immunization, providing vital protection while their own immune system is still developing. Additionally, it has a laxative effect that helps the baby pass their first stool.

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CHAPTER 06

Genetic Diseases and Sickle Cell Anemia

1. Which of the following is an example of an autosomal dominant genetic disorder?
(A) Sickle cell anemia, an autosomal recessive trait
(B) Hemophilia
(C) Cystic fibrosis
(D) Huntington's disease

2. Identify the incorrect statement regarding color blindness.
(A) Red-green color blindness is an X-linked recessive trait.
(B) Females must inherit two copies of the mutated gene to be color blind.
(C) A color blind male inherited the defective gene from his father.
(D) Males are more frequently affected by red-green color blindness than females.

3. Read the following statements and select the correct option.
Statement I: The human genome consists of 23 pairs of chromosomes.
Statement II: Out of these 23 pairs, 22 pairs are autosomes and 1 pair is the sex chromosome.
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

4. Which statement correctly describes the pathophysiology of sickle cell anemia?
(A) Red blood cells become flexible and survive much longer.
(B) The body produces an excessive amount of normal cells, thickening the blood.
(C) HbS polymerizes in low oxygen, deforming cells.
(D) The mutation causes total destruction of red cells in bone marrow before release.

5. Which of the following is not a recognized type of genetic mutation?
(A) Frameshift mutation type
(B) Epigenetic translation
(C) Missense mutation type
(D) Nonsense mutation type

6. Consider the following statements regarding the prevalence of Sickle Cell Anemia in Madhya Pradesh:
I. It is predominantly found in the tribal populations of the state.
II. The Baiga and Gond tribes are among the most affected communities.
III. It is evenly distributed across all urban and rural districts of MP without demographic variation.
IV. High prevalence has prompted specific state-level public health interventions.
Which of the above statement(s) is/are correct?
(A) I, II, and IV
(B) I, III, and IV
(C) II, III, and IV
(D) I, II, and III

7. What is the fundamental physical and functional unit of heredity in living organisms?
(A) Chromosome
(B) Gene
(C) Protein
(D) Ribosome

8. Which of the following best defines multifactorial genetic disorders?
(A) Disorders caused by a single allele mutation from one parent.
(B) Disorders from combined genetic and environmental factors.
(C) Disorders caused by the addition of an entire extra chromosome.
(D) Disorders that specifically affect only the sex chromosomes.

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9. The following question consists of two statements—Assertion (A) and Reason (R). Select the correct answer using the codes given below.
Assertion (A): The sickle cell trait provides a natural survival advantage in malaria-endemic regions.
Reason (R): The presence of abnormal hemoglobin S in heterozygous individuals inhibits the proliferation of the malaria parasite inside red blood cells.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

10. If a trait is expressed in a heterozygous individual, the trait is classified as which of the following?
(A) Recessive
(B) Codominant
(C) Dominant
(D) Polygenic

11. In which year does the National Sickle Cell Anemia Elimination Mission target the complete elimination of sickle cell disease as a public health problem in India?
(A) 2030
(B) 2035
(C) 2047
(D) 2050

12. Match the genetic terms in List I with their correct definitions in List II.
List I: (Genetic terms)
P. Phenotype
Q. Genotype
R. Allele
S. Homozygous
List II: (Definitions)
1. An alternative form of a gene
2. The observable physical traits of an organism
3. Having two identical alleles for a particular gene
4. The genetic makeup of an organism
Select the correct combination:
(A) P-2, Q-4, R-1, S-3
(B) P-4, Q-2, R-1, S-3
(C) P-2, Q-4, R-3, S-1
(D) P-1, Q-2, R-4, S-3

13. Read the following statements and select the correct option.
Statement I: Hemophilia A is caused by a deficiency in clotting factor VIII.
Statement II: Hemophilia is typically inherited in an autosomal dominant pattern.
(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

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14. Trisomy 21 is clinically referred to as which of the following conditions?
(A) Patau syndrome
(B) Turner syndrome
(C) Down syndrome
(D) Klinefelter syndrome

15. Read the following statements and select the correct option.
Statement I: Hemoglobin electrophoresis is a standard diagnostic method used to differentiate between normal hemoglobin and hemoglobin S.
Statement II: Newborn screening for sickle cell disease is primarily conducted through a visual examination of the infant's skin color.
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

16. Which of the following components correctly defines the basic building blocks of a DNA nucleotide?
(A) Sugar, phosphate group, and nitrogenous base
(B) A sugar, an amino acid, and a specific nitrogenous base
(C) A lipid, a phosphate group, and an amino acid
(D) A sugar, a lipid, and a nitrogenous base

17. What defines the difference between sickle cell trait and sickle cell disease?
(A) Trait is heterozygous, disease is homozygous.
(B) Trait involves two mutant alleles, while disease involves one.
(C) Trait is managed by dietary changes, while disease requires surgery.
(D) Trait affects only white blood cells, while disease affects red cells.

18. Choose the odd one out regarding the classification of genetic diseases.
(A) Common bacterial infections
(B) Single gene genetic disorders
(C) Chromosomal abnormalities
(D) Multifactorial disorders

19. A child is diagnosed with Phenylketonuria (PKU). What dietary modification must be strictly applied to manage this condition?
(A) High protein diet rich in all essential amino acids
(B) Complete avoidance of all dietary carbohydrates
(C) High iron diet to prevent severe anemia
(D) Dietary restriction of phenylalanine intake

20. Arrange the following structural levels of genetic material in order from the simplest to the most complex.
1. Nucleotide
2. Chromosome
3. DNA double helix
4. Genome
Select the correct order:
(A) 1, 3, 2, 4
(B) 1, 2, 3, 4
(C) 3, 1, 2, 4
(D) 4, 2, 3, 1

21. Choose the odd one out regarding districts in Madhya Pradesh heavily affected by sickle cell anemia based on tribal demography.
(A) Mandla
(B) Dindori
(C) Indore
(D) Balaghat

22. What is the primary cause of a point mutation in a DNA sequence?
(A) The deletion of an entire chromosome
(B) The substitution of a single nucleotide base
(C) The non-disjunction of chromosomes during meiosis
(D) The duplication of a large chromosomal segment

23. Which of the following statements correctly describes sex-linked inheritance?
(A) It involves genes typically located on the somatic autosomes.
(B) Y-linked traits can be passed from fathers to their daughters.
(C) Mothers pass X-linked dominant traits to every single child.
(D) X-linked recessive disorders are more common in males.

24. The genetic mutation causing sickle cell anemia occurs in the gene responsible for producing which specific protein subunit?
(A) Alpha-globin
(B) Gamma-globin
(C) Delta-globin
(D) Beta-globin

25. Thalassemia is a genetic blood disorder primarily characterized by the abnormal production of which molecule?
(A) White blood cells
(B) Hemoglobin
(C) Platelets
(D) Plasma proteins

26. Identify the incorrect statement regarding Gregor Mendel's laws of inheritance.
(A) The Law of Segregation states that allele pairs separate during gamete formation.
(B) Mendel used Pisum sativum (pea plants) for his genetic experiments.
(C) The Law of Dominance states that one trait will conceal the presence of another trait for the same characteristic.
(D) The Law of Independent Assortment applies only to genes located on the same chromosome.

27. Which of the following is a direct clinical consequence of vaso-occlusive crisis in sickle cell anemia patients?
(A) Severe episodes of pain and potential organ damage

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(B) Rapid weight gain and fluid retention
(C) Enhanced immune response and overactive spleen
(D) Increased capacity for strenuous physical exercise

28. Consider the following statements regarding chromosomal disorders:
I. Down syndrome is caused by an extra copy of chromosome 21.
II. Turner syndrome affects only males by adding an extra X chromosome.
III. Chromosomal disorders typically result from errors during cell division.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I, II, and III

29. Which of the following statements is incorrect regarding Albinism?
(A) It is caused by a defect in melanin production.
(B) It is typically inherited as an autosomal recessive trait.
(C) It provides resistance to ultraviolet radiation damage.
(D) It can affect the skin, hair, and eyes.

30. What is the phenotypic effect of a female inheriting only one X chromosome (45, X0)?
(A) Down syndrome
(B) Thalassemia disorder
(C) Hemophilia condition
(D) Turner syndrome

31. What is a likely positive effect of community awareness campaigns regarding sickle cell anemia in tribal districts?
(A) Significant increase in social isolation of individuals.
(B) Complete eradication of the genetic mutation within one generation
(C) Reducing disease stigma and increasing screening rates.
(D) Increased reluctance to consult healthcare professionals

32. A female carrier of hemophilia marries a normal male. What is the probability that their son will be affected by hemophilia?
(A) 0%
(B) 25%
(C) 50%
(D) 100%

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33. All of the following are benefits of using Hydroxyurea in sickle cell disease management, except:
(A) Significantly reducing the frequency of painful crises.
(B) Permanent genetic editing of the defective gene.
(C) It increases the production of fetal hemoglobin (HbF).
(D) It reduces the need for frequent blood transfusions.

34. Match the affected MP tribal districts in List I with their respective geographical divisions in List II.
List I: (Tribal districts)
P. Mandla
Q. Balaghat
R. Seoni
S. Chhindwara
List II: (Geographical divisions)
1. Jabalpur Division (Southern part, bordering Maharashtra)
2. Jabalpur Division (Central, adjacent to Dindori)
3. Jabalpur Division (Wainganga valley region)
4. Jabalpur Division (Satpura plateau, Pench region)
Select the correct combination:
(A) P-2, Q-3, R-4, S-1
(B) P-3, Q-2, R-1, S-4
(C) P-2, Q-4, R-3, S-1
(D) P-4, Q-3, R-2, S-1

35. Consider the following ethical issues related to genetic testing:
I. Potential for genetic discrimination by employers or insurance companies.
II. Violations of patient privacy regarding their genetic data.
III. Eugenics concerns related to selecting specific traits in offspring.
IV. Psychological distress upon learning about

untreatable genetic risks.
V. Mandating genetic modification for all citizens to eliminate traits.

Which of the following combination accurately reflects recognized ethical concerns in modern genetic testing (excluding extreme fictional scenarios)?
(A) I, II, III, and IV
(B) I, III, IV, and V
(C) II, III, IV, and V
(D) I, II, IV, and V

36. Which of the following is the most appropriate strategy for the National Sickle Cell Anemia Elimination Mission 2047?
(A) Universal screening of those aged 0-40 in tribal areas.
(B) Sole reliance on imported gene therapies
(C) Banning all marriages between tribal and non-tribal groups.
(D) Establishing isolated colonies for sickle cell patients

37. Which of the following is the most appropriate primary objective of the MP state programme for sickle cell screening?
(A) To universally screen the tribal population for early detection and management
(B) To mandate the sterilization of individuals with sickle cell disease
(C) To strictly prohibit marriages among tribal populations
(D) To relocate affected tribal populations to urban healthcare centers

38. Read the following statements and select the correct option.
Statement I: Adenine always pairs with Thymine in a double-stranded DNA molecule.
Statement II: Cytosine pairs with Guanine via two hydrogen bonds.
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

39. Normal adult hemoglobin (HbA) is composed of which combination of globin chains?
(A) Two alpha chains and two gamma chains
(B) Two beta chains and two delta chains
(C) Four beta chains
(D) Two alpha chains and two beta chains

40. Premarital screening in populations with high sickle cell prevalence is primarily aimed at preventing which scenario?
(A) A marriage between a known carrier and a normal individual.
(B) Transmission of communicable blood-borne diseases
(C) The development of nutritional anemia in pregnant women
(D) Marriage between two individuals carrying the trait.

41. Identify the correct statement regarding the genetic mutation responsible for sickle cell anemia.
(A) It involves the deletion of an entire exon in the alpha-globin gene.
(B) It involves the substitution of valine for glutamic acid at the sixth position of the beta-globin chain.
(C) It is caused by the insertion of an extra nucleotide sequence in the regulatory region.
(D) It involves the substitution of glutamic acid for valine at the sixth position of the beta-globin chain.

42. Match the genetic disorders in List I with their primary underlying causes in List II.
List I: (Genetic disorders)
P. Thalassemia
Q. Down syndrome
R. Phenylketonuria (PKU)
S. Color blindness
List II: (Primary causes)
1. Deficiency in the enzyme phenylalanine hydroxylase
2. X-linked recessive gene mutation
3. Imbalance in alpha or beta globin chain synthesis
4. Trisomy of chromosome 21
Select the correct combination:
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-1, S-2

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(C) P-3, Q-4, R-2, S-1
(D) P-1, Q-2, R-3, S-4

43. Select the correct sequence of steps involved in the execution of a genetic disease screening camp under the MP state programme.
(A) Counseling of positive cases → Confirmatory HPLC test → Initial mass screening → Community mobilization
(B) Community mobilization → Initial mass screening → Confirmatory HPLC test → Counseling of positive cases
(C) Confirmatory HPLC test → Initial mass screening → Community mobilization → Counseling of positive cases
(D) Initial mass screening → Community mobilization → Counseling of positive cases → Confirmatory HPLC test

44. Which national body plays a central role in formulating guidelines and funding research for genetic diseases in India?
(A) NITI Aayog
(B) Medical Council of India (MCI)
(C) Council of Scientific and Industrial Research (CSIR)
(D) Indian Council of Medical Research (ICMR)

45. All of the following are valid reasons for conducting newborn screening for sickle cell anemia, except:
(A) Initiating prophylactic penicillin therapy early in life.
(B) To prevent the early onset of pneumococcal infections
(C) Immediately performing transplants in the first week.
(D) To provide early genetic counseling to parents

46. Identify the correct statement regarding the role of tribal health workers (e.g., ASHAs/Mitanins) in sickle cell management.
(A) They independently perform bone marrow transplants in villages.
(B) Mobilizing the community and providing basic counseling.
(C) They are authorized to prescribe experimental gene therapies to individuals.
(D) They conduct high-performance liquid chromatography testing within local homes.

47. Identify the incorrect statement regarding the sickle cell trait.
(A) Individuals with the trait are generally asymptomatic.
(B) The trait cannot be passed on to the next generation if only one parent has it.
(C) Individuals with the trait have a normal life expectancy.
(D) It provides a protective advantage against severe Plasmodium falciparum malaria.

48. Read the following statements and select the correct option.
Statement I: Carrier testing determines whether an asymptomatic individual carries one copy of a mutated gene for an autosomal recessive disorder.
Statement II: Premarital screening for sickle cell trait is discouraged due to ethical controversies in Madhya Pradesh.
(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

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49. Alpha thalassemia is generally caused by mutations in genes located on which chromosome?
(A) Chromosome 16
(B) Chromosome 11
(C) Chromosome 21
(D) X Chromosome

50. All of the following traits were studied by Gregor Mendel in his pea plant experiments, except:
(A) Seed color
(B) Flower position
(C) Leaf thickness
(D) Pod shape

51. The National Institute of Research in Tribal Health (NIRTH), which conducts significant research on sickle cell in MP, is located in which city?
(A) Bhopal
(B) Indore
(C) Gwalior
(D) Jabalpur

52. What is the primary purpose of genetic counseling for prospective parents?

(A) Guaranteeing the birth of a healthy child without defects.
(B) To legally prevent carriers from having biological children
(C) To alter the genetic makeup of the parents before conception
(D) Assessing and communicating the risk of inherited disorders.

53. Identify the incorrect statement regarding CRISPR technology.
(A) It stands for Clustered Regularly Interspaced Short Palindromic Repeats.
(B) It utilizes the Cas9 enzyme to cut DNA at specific targeted locations.
(C) It was originally discovered as an adaptive immune system in humans.
(D) It offers potential for correcting the point mutation that causes sickle cell anemia.

54. Which of the following physiological conditions is most likely to trigger a sickle cell crisis in a patient?
(A) High oxygen saturation at sea level
(B) Mild hyperthermia from a hot bath
(C) Dehydration and hypoxia
(D) Excessive intake of dietary iron

55. Choose the odd one out among the following genetic conditions.
(A) Turner syndrome
(B) Sickle cell anemia
(C) Thalassemia
(D) Cystic fibrosis

56. A severe sickle cell patient is advised to undergo a bone marrow transplant. What is the fundamental requirement for this procedure to be successful?
(A) Requirement for an HLA-matched donor, typically a relative.
(B) Requirement that the patient receive a different blood group.
(C) The procedure must only be performed using bone marrow from an animal model.
(D) The patient must be older than 50 years to withstand the treatment.

57. Read the following statements and select the correct option.
Statement I: Gel electrophoresis separates hemoglobin molecules based on their electrical charge and size.
Statement II: Hemoglobin S moves at a different speed compared to normal Hemoglobin A during electrophoresis.
(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

58. Which of the following best defines gene therapy as a future treatment option for genetic diseases?
(A) Altering or introducing genetic material into cells.
(B) Managing symptoms using regular blood transfusion therapy.
(C) Using dietary supplements to correct enzyme deficiencies
(D) Counseling patients on how to cope with genetic disorders psychologically

59. Identify the correct pair of chromosomal disorder and its corresponding genetic anomaly.
(A) Down syndrome – 47, XXY
(B) Klinefelter syndrome – Trisomy 18
(C) Turner syndrome – 45, X0
(D) Patau syndrome – Monosomy X

60. What is the most appropriate reason for linking sickle cell screening with the tribal welfare policy in Madhya Pradesh?
(A) To completely relocate the tribal population to other areas.
(B) Targeted resources for disproportionately affected groups.
(C) To replace traditional tribal medicine completely without consultation
(D) To restrict the movement of tribal populations across state borders

61. What is a direct long-term effect of repeated splenic infarctions in a child with sickle cell disease?
(A) Hyperactive immune response resulting in chronic allergies.
(B) Massive enlargement of the spleen into adulthood
(C) Autosplenectomy or functional loss of the spleen.
(D) Increased production of normal red blood

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cells

62. Identify the incorrect statement regarding the limitations of bone marrow transplantation for sickle cell disease.
(A) A simple outpatient procedure without hospitalization.
(B) Finding a fully matched sibling donor is difficult for many patients.
(C) The procedure carries a significant risk of Graft-Versus-Host Disease (GVHD).
(D) The conditioning regimen involves high-dose chemotherapy.

63. Which biological agents are most commonly modified and used as vectors in gene therapy to deliver healthy genes into human cells?
(A) Viruses
(B) Bacteria
(C) Fungi
(D) Protozoa

64. Read the following statements and select the correct option.
Statement I: Hemophilia B is caused by a deficiency in clotting factor IX.
Statement II: Hemophilia A and Hemophilia B can be clinically distinguished based entirely on their physical symptoms without blood tests.
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

65. Which of the following scenarios is the most appropriate representation of autosomal dominant inheritance?
(A) Every affected individual must have at least one affected parent.
(B) An affected child can be born to two phenotypically normal parents.
(C) The trait tends to skip generations in a family pedigree.
(D) Males are significantly more affected than females.

66. Consider the following statements regarding Mendel's Law of Independent Assortment:
I. It states that alleles of different genes assort independently of one another during gamete formation.
II. It is based on observations from monhybrid crosses.
III. It results in a phenotypic ratio of 9:3:3:1 in a standard dihybrid cross.
IV. The law holds strictly true for genes that are closely linked on the same chromosome.
Which of the above statement(s) is/are incorrect?
(A) I and III
(B) II and IV
(C) I and II
(D) III and IV

67. A sickle cell patient is prescribed Hydroxyurea. By what primary mechanism does this drug alleviate symptoms?
(A) It permanently alters the DNA of the bone marrow cells.
(B) Acting as a powerful painkiller for the nervous system.
(C) Increasing fetal hemoglobin levels to prevent sickling.
(D) It dissolves blood clots that have formed in the capillaries.

68. Read the following statements and select the correct option.
Statement I: Vaso-occlusive crisis occurs when stiff, sickle-shaped red blood cells block small blood vessels.
Statement II: This blockage leads to ischemia, severe pain, and potential organ damage.
(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

69. Arrange the sequence of physiological events that occur during a sickle cell crisis.
1. Oxygen levels drop in the bloodstream.
2. Sickled cells clump together and block capillaries.
3. Mutant hemoglobin (HbS) molecules polymerize and form rigid fibers.
4. Tissues suffer from lack of oxygen (ischemia) causing pain.
5. Red blood cells distort into a sickle shape.

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Select the correct sequence:
(A) 1, 3, 5, 2, 4
(B) 1, 5, 3, 2, 4
(C) 3, 1, 5, 4, 2
(D) 5, 1, 3, 2, 4

70. Albinism is primarily caused by a deficiency or defect in which enzyme?
(A) Hexosaminidase A
(B) Phenylalanine hydroxylase
(C) Tyrosinase
(D) Glucose-6-phosphate dehydrogenase

71. Which of the following represents the normal sex chromosome complement of a human male?
(A) XY
(B) XX
(C) XO
(D) XXY

72. Read the following statements and select the correct option.
Statement I: The concept of eugenics raises major ethical concerns in the application of genetic engineering.
Statement II: Somatic cell gene therapy raises more ethical controversies than germline gene therapy because its effects are passed on to the next generation.
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

73. What causes the characteristic manifestation of jaundice in patients with sickle cell disease?
(A) The liver producing excess bile due to high dietary fat.
(B) A direct viral infection of the liver linked to the genetic mutation
(C) The failure of the kidneys to excrete normal hemoglobin
(D) Hemolysis of fragile sickle cells releasing bilirubin.

74. If two parents are carriers of the sickle cell trait (HbAS), what is the statistical probability that their child will be born with sickle cell disease (HbSS)?
(A) 25%
(B) 50%
(C) 75%
(D) 100%

75. Which of the following is the most appropriate example of a multifactorial genetic disorder commonly prevalent in India?
(A) Down syndrome
(B) Sickle cell anemia
(C) Hemophilia
(D) Type 2 Diabetes Mellitus

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76. The following question consists of two statements—Assertion (A) and Reason (R). Select the correct answer using the codes given below.
Assertion (A): Consanguineous marriages increase the incidence of autosomal recessive disorders in a population.
Reason (R): Close relatives have a higher probability of carrying the same recessive mutant allele inherited from a common ancestor.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

77. Identify the correct distinction between Thalassemia Major and Thalassemia Minor.
(A) Thalassemia Major individuals are asymptomatic carriers, while Minor individuals suffer severe anemia.
(B) Thalassemia Major affects only males, whereas Minor affects only females.
(C) Thalassemia Major is caused by an extra chromosome, whereas Minor is a single gene mutation.
(D) Thalassemia Major requires lifelong blood transfusions, whereas Minor typically requires no specific treatment.

78. Consider the following statements about Phenylketonuria (PKU):
I. It is an inborn error of metabolism inherited in an autosomal recessive manner.
II. If left untreated, it leads to severe intellectual

disability and developmental delays.
III. The condition is managed by increasing the dietary intake of the amino acid phenylalanine.
Which of the above statement(s) is/are correct?
(A) I and II
(B) II and III
(C) I and III
(D) I, II, and III

79. Pre-implantation genetic diagnosis is an advanced genetic technique utilized primarily in conjunction with which reproductive technology?
(A) Artificial insemination
(B) In Vitro Fertilization (IVF)
(C) Surrogate monitoring
(D) Traditional natural conception

80. Match the following diagnostic terms in List I with their primary applications in List II.
List I: (Diagnostic terms)
P. Karyotyping
Q. Electrophoresis
R. Pedigree Analysis
S. Pre-implantation Genetic Diagnosis (PGD)
List II: (Applications)
1. Tracing the inheritance pattern of a trait through a family tree
2. Visualizing chromosomes to detect numerical or structural abnormalities
3. Screening embryos during IVF before transfer to the uterus
4. Separating proteins (like hemoglobin) based on charge and size
Select the correct combination:
(A) P-2, Q-4, R-1, S-3
(B) P-4, Q-2, R-1, S-3
(C) P-1, Q-3, R-2, S-4
(D) P-2, Q-1, R-4, S-3

81. A frameshift mutation is most commonly caused by which type of DNA alteration?
(A) Substitution of a single base pair
(B) Inversion of a chromosomal segment
(C) Insertion or deletion of nucleotides not divisible by three.
(D) Translocation of gene segments between different chromosomes.

82. Identify the incorrect statement about the tribal population and sickle cell prevalence in Madhya Pradesh.
(A) The sickle cell gene is completely absent in the Gond and Bhil communities.
(B) MP has the highest tribal population in India, making it highly vulnerable to the sickle cell burden.
(C) Screening programs in MP specifically target high-burden districts like Dindori and Mandla.
(D) The state government integrates sickle cell management with rural health missions.

83. Identify the correct pair of a genetic concept and its respective discoverer/proponent.
(A) Law of Inheritance – Charles Darwin
(B) CRISPR-Cas9 mechanism – Gregor Mendel
(C) Polymerase Chain Reaction – Rosalind Franklin
(D) DNA Double Helix Structure – Watson and Crick

84. The MP state government's initiatives for sickle cell management primarily operate under the broader umbrella of which national health mission?
(A) National Urban Health Mission (NUHM)
(B) Swachh Bharat Abhiyan
(C) National Health Mission (NHM)
(D) Pradhan Mantri Jan Dhan Yojana

85. Choose the odd one out regarding the classical symptoms of sickle cell anemia.
(A) Dactylitis (swelling of hands and feet).
(B) Jaundice
(C) Uncontrolled bleeding.
(D) Chronic and severe anemia.

86. Choose the odd one out regarding the primary components required for a functional CRISPR-Cas9 genome editing system.
(A) Cas9 nuclease enzyme.
(B) Reverse transcriptase enzyme.
(C) Guide RNA (gRNA) targeting molecule.
(D) Target DNA sequence

87. A female who is heterozygous for the color blindness gene will exhibit which of the following phenotypes?
(A) Fully color blind in both eyes.

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(B) Vision is normal, but carrier.
(C) Blind in one eye only
(D) Heightened color perception

88. Which of the following is not a typical clinical feature of Turner syndrome?
(A) Short stature
(B) Severe mental retardation
(C) Webbed neck
(D) Gonadal dysgenesis (streak ovaries)

89. Which of the following is not a proposed application of CRISPR and genome editing?
(A) Directly correcting the mutation causing cystic fibrosis.
(B) Developing antibiotics targeting bacterial cell walls.
(C) Creating crops that are highly resistant to pests and drought
(D) Engineering immune cells to better target cancer cells

90. In the context of Madhya Pradesh, which district is widely recognized as having one of the highest concentrations of sickle cell anemia cases among its tribal demographics?
(A) Dindori
(B) Bhopal
(C) Gwalior
(D) Ujjain

91. Read the following statements and select the correct option.
Statement I: Genetic counseling is a mandatory and legally enforced process for all couples in Madhya Pradesh before marriage.
Statement II: A key component of genetic counseling involves maintaining strict confidentiality of the patient's genetic information.
(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is incorrect
(D) Statement I is incorrect but Statement II is true

92. At the molecular level, sickle cell anemia is caused by a single nucleotide polymorphism that replaces Adenine with which nitrogenous base in the DNA sequence?
(A) Guanine
(B) Cytosine
(C) Thymine
(D) Uracil

93. Non-disjunction during meiosis is the primary mechanism leading to which of the following genetic consequences?
(A) Point mutations
(B) Frameshift mutations
(C) Polygenic inheritance of various human traits.
(D) Aneuploidy (abnormal chromosome count).

94. Which of the following most appropriately describes the ICMR guidelines regarding human germline gene therapy in India?
(A) It is actively encouraged to improve the population's genetic health.
(B) Allowed only for treating sickle cell and thalassemia.
(C) Prohibited due to unknown effects on future offspring.
(D) It is permitted only if performed by foreign medical practitioners.

95. In managing sickle cell anemia and thalassemia, patients undergoing frequent blood transfusions are most at risk for which major complication?
(A) Iron overload.
(B) Severe hypotension.
(C) Vitamin C deficiency.
(D) Hypothyroidism.

96. Consider the following clinical features:
I. Slanted eyes with epicanthic folds
II. Single palmar crease
III. Flat facial profile
IV. Uncontrollable bleeding
V. Mild to moderate intellectual disability
Which of the above combination(s) accurately reflects the clinical manifestations of Down Syndrome?
(A) I, II, III, and V
(B) I, II, IV, and V
(C) II, III, IV, and V
(D) I, III, IV, and V

97. Identify the incorrect statement regarding the current challenges of gene therapy for genetic diseases.

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(A) Gene therapy is a cheap treatment for rural centers.
(B) Delivery of genes to specific target cells is difficult.
(C) The human immune system may attack the viral vectors used for delivery.
(D) There is a risk of insertional mutagenesis, which could potentially cause cancer.

98. Match the genetic interventions in List I with their corresponding primary objectives in List II.
List I: (Genetic interventions)
P. Premarital Screening
Q. Newborn Screening
R. Gene Therapy
S. Genetic Counseling
List II: (Objectives)
1. Early detection in infants to prevent severe complications
2. Assisting families in understanding inheritance risks and options
3. Identifying carrier status in prospective couples to prevent disease transmission
4. Attempting a permanent cure by correcting the defective DNA sequence
Select the correct combination:
(A) P-3, Q-1, R-4, S-2
(B) P-1, Q-3, R-2, S-4
(C) P-3, Q-1, R-2, S-4
(D) P-2, Q-4, R-1, S-3

99. Identify the correct pair representing a tribal district in MP heavily burdened by sickle cell anemia and the major hill range characterizing its geography.
(A) Jhabua – Kaimur Range
(B) Chhindwara – Vindhyan Range
(C) Mandla – Aravalli Range
(D) Dindori – Maikal Range

100. Select the correct sequence of procedural stages in the National Sickle Cell Anemia Elimination Mission strategy.
(A) Universal mass screening → Issuance of color-coded sickle cell cards → Genetic counseling of carriers → Targeted prenatal diagnosis
(B) Targeted prenatal diagnosis → Universal mass screening → Genetic counseling of carriers → Issuance of color-coded sickle cell cards
(C) Issuance of color-coded sickle cell cards → Targeted prenatal diagnosis → Universal mass screening → Genetic counseling of carriers
(D) Genetic counseling of carriers → Issuance of color-coded sickle cell cards → Targeted prenatal diagnosis → Universal mass screening

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ANSWERS

1. (D) Huntington's disease
Huntington's disease is a neurodegenerative disorder inherited in an autosomal dominant pattern. This means a single copy of the altered gene in each cell is sufficient to cause the condition. Affected individuals typically have one affected parent. Unlike recessive traits like sickle cell anemia, the presence of just one dominant allele results in the expression of the phenotype.

2. (C) A color blind male inherited the defective gene from his father.
Red-green color blindness is an X-linked recessive trait. In males, the single X chromosome is inherited from the mother, while the father provides the Y chromosome. Therefore, a male cannot inherit an X-linked trait from his father. Females require two copies of the mutated gene to express the condition, whereas males need only one, making them more affected.

3. (A) Both Statement I and Statement II are correct
The human genome consists of 46 chromosomes organized into 23 pairs. Among these, 22 pairs are known as autosomes, which carry genes for general body characteristics. The 23rd pair consists of sex chromosomes, which determine the biological sex of an individual. This organization is standard across healthy human cells, ensuring the proper distribution of genetic information during cell division.

4. (C) HbS polymerizes in low oxygen, deforming cells.
Sickle cell anemia involves a mutation in the beta-globin gene, resulting in abnormal hemoglobin S. Under low oxygen conditions, these hemoglobin molecules polymerize into long, rigid fibers. This process distorts red blood cells into a crescent or sickle shape. These deformed cells are inflexible, leading to vessel blockages, reduced cell lifespan, and various clinical complications like pain and organ damage.

5. (B) Epigenetic translation
Frameshift, missense, and nonsense mutations are recognized changes in the DNA sequence that affect protein synthesis. Epigenetics refers to modifications that affect gene expression without changing the DNA sequence itself. Translation is the process of synthesizing proteins from RNA. Therefore, the term combines two distinct biological concepts and does not represent a specific category of genetic mutation in molecular biology.

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6. (A) I, II, and IV
Sickle cell anemia in Madhya Pradesh is concentrated within tribal populations, particularly affecting the Gond and Baiga communities. Due to this high regional burden, the state has implemented specific public health interventions to manage and screen for the disease. The distribution is not uniform across all demographics, as it remains significantly more prevalent in specific rural and tribal districts.

7. (B) Gene
A gene is the basic physical and functional unit of heredity. Composed of DNA, genes act as instructions to make molecules called proteins. In humans, genes vary in size from a few hundred DNA bases to more than two million bases. They are responsible for the transmission of traits from parents to offspring, determining various characteristics and biological functions.

8. (B) Disorders from combined genetic and environmental factors.
Multifactorial genetic disorders result from the complex interaction of multiple genes and various environmental factors. Unlike single-gene disorders, these conditions do not follow a simple Mendelian inheritance pattern. Common examples include heart disease, diabetes, and obesity. In these cases, a person may inherit a genetic predisposition, but environmental triggers often play a critical role in the actual disease manifestation.

9. (A) Both A and R are true and R is the correct explanation of A.
The sickle cell trait provides a survival advantage against malaria. Individuals who

are heterozygous for the sickle cell gene have red blood cells that inhibit the growth and proliferation of the Plasmodium parasite. This natural selection explains why the sickle cell gene remains prevalent in regions where malaria is endemic, as carriers are more likely to survive the infection.

10. (C) Dominant
A dominant trait is one that is expressed in an individual even if they only possess one copy of the associated allele. In a heterozygous genotype, the dominant allele masks the effect of the recessive allele. This principle of dominance is a cornerstone of Mendelian genetics, explaining how certain physical characteristics can appear in offspring when only one parent contributes the gene.

11. (C) 2047
The Government of India launched the National Sickle Cell Anemia Elimination Mission with a specific target to eliminate the disease as a public health threat by the year 2047. This initiative focuses on universal screening, counseling, and integrated management. The timeline aligns with India's centenary of independence, emphasizing a long-term commitment to improving health outcomes in affected communities.

12. (A) P-2, Q-4, R-1, S-3
Phenotype refers to observable physical traits, while genotype is the underlying genetic makeup. Alleles are alternative forms of a specific gene. Homozygous individuals possess two identical alleles for a particular trait. Understanding these definitions is fundamental to genetics, as they describe how traits are represented in the genome and how they manifest physically through inheritance patterns and gene expression.

13. (C) Statement I is true but Statement II is false
Hemophilia A is a bleeding disorder caused by a deficiency in clotting factor VIII. However, hemophilia is typically inherited in an X-linked recessive pattern rather than an autosomal dominant one. This means the condition primarily affects males, who have only one X chromosome. Females are usually carriers and only express the disease if they inherit two defective copies of the gene.

14. (C) Down syndrome
Down syndrome is a chromosomal condition caused by the presence of an extra copy of chromosome 21, also known as trisomy 21. This additional genetic material alters the course of development and causes the characteristic clinical features associated with the syndrome. It is the most common chromosomal abnormality in humans and typically results from an error during the division of cells.

15. (C) Statement I is correct but Statement II is incorrect
Hemoglobin electrophoresis is a reliable laboratory technique used to identify different types of hemoglobin and confirm sickle cell status. Conversely, newborn screening cannot be conducted through visual skin examination, as genetic blood disorders do not manifest through simple external color changes at birth. Accurate diagnosis requires specialized biochemical or molecular testing to detect the presence of abnormal hemoglobin variants.

16. (A) Sugar, phosphate group, and nitrogenous base
A DNA nucleotide consists of three essential chemical components: a five-carbon sugar called deoxyribose, a phosphate group, and one of four nitrogenous bases. These nucleotides serve as the building blocks of the DNA double helix. The phosphate and sugar molecules form the backbone of the structure, while the nitrogenous bases provide the genetic code through their specific sequences and pairings.

17. (A) Trait is heterozygous, disease is homozygous.
Sickle cell trait occurs in individuals who inherit one normal hemoglobin gene and one mutated gene, making them heterozygous. These individuals are usually asymptomatic carriers. In contrast, sickle cell disease occurs when an individual inherits two mutated genes, making them homozygous. This condition results in the production of abnormal hemoglobin S, leading to the clinical symptoms and complications of the disorder.

18. (A) Common bacterial infections
Single-gene disorders, chromosomal abnormalities, and multifactorial disorders are all categories of genetic diseases caused by

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alterations in the genome. Common bacterial infections, however, are infectious diseases caused by external pathogens rather than internal genetic mutations. While genetics can influence a person's susceptibility to infections, the primary cause of these illnesses is the presence and proliferation of harmful bacteria.

19. (D) Dietary restriction of phenylalanine intake
Phenylketonuria is an inborn error of metabolism where the body cannot properly break down the amino acid phenylalanine due to an enzyme deficiency. To prevent the accumulation of phenylalanine to toxic levels, which can cause intellectual disability, affected individuals must follow a strict diet. This modification involves limiting high-protein foods and using specialized formulas to ensure proper growth and health.

20. (A) 1, 3, 2, 4
Genetic material is organized in a hierarchy of complexity. The simplest unit is the nucleotide, which serves as the building block for the DNA double helix. The double helix is further coiled and packaged into structures called chromosomes. Finally, the complete set of chromosomes and genetic information within an organism constitutes the genome, representing the most complex level of genetic organization.

21. (C) Indore
Mandla, Dindori, and Balaghat are districts in Madhya Pradesh with significant tribal populations and a high prevalence of sickle cell anemia. Indore, being a major urban and commercial hub, does not share the same demographic profile or high concentration of sickle cell cases found in the state's tribal heartland. Public health efforts for this genetic condition are concentrated in these rural areas.

22. (B) The substitution of a single nucleotide base
A point mutation is a type of genetic change where a single nucleotide base in the DNA sequence is altered. This can involve the substitution of one base for another, which may change the resulting amino acid in a protein. Unlike large-scale chromosomal abnormalities or deletions, point mutations affect only a tiny portion of the gene but can still lead to significant disorders.

23. (D) X-linked recessive disorders are more common in males.
Sex-linked inheritance involve genes located on the sex chromosomes, typically the X chromosome. X-linked recessive disorders occur more frequently in males because they have only one X chromosome. If they inherit a mutated gene, the trait is expressed. Females have two X chromosomes, so a normal allele can often mask the effect of a single mutated one, making them asymptomatic carriers.

24. (D) Beta-globin
The mutation responsible for sickle cell anemia occurs in the HBB gene, which encodes the beta-globin protein. This protein is a vital component of hemoglobin, the molecule in red blood cells that carries oxygen. A specific substitution in the beta-globin chain causes hemoglobin molecules to stick together, leading to the distortion of red blood cells and the symptoms of the disease.

25. (B) Hemoglobin
Thalassemia is a group of inherited blood disorders characterized by a reduction in the synthesis of hemoglobin chains. This imbalance leads to the production of abnormal hemoglobin and the destruction of red blood cells, resulting in anemia. Depending on which globin chain is affected, the condition is classified as alpha or beta thalassemia, impacting the blood's ability to transport oxygen effectively.

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26. (D) The Law of Independent Assortment applies only to genes located on the same chromosome.
Mendel's Law of Independent Assortment states that genes for different traits segregate independently during the formation of gametes. This law holds true for genes located on different chromosomes or those far apart on the same chromosome. If genes are very close together on the same chromosome, they are often linked and do not assort independently, which is an exception to Mendel's original law.

27. (A) Severe episodes of pain and potential organ damage
A vaso-occlusive crisis is a hallmark of sickle cell anemia, occurring when sickled red blood cells obstruct blood flow in small vessels. This blockage deprives tissues of oxygen, causing intense pain. Over time, repeated crises can lead to permanent

damage in various organs, including the spleen, lungs, and kidneys. Managing these episodes is a critical part of care for affected patients.

28. (C) I and III
Down syndrome is indeed caused by an extra copy of chromosome 21, and chromosomal disorders generally arise from errors in cell division, such as non-disjunction. However, Turner syndrome affects females, not males, and is characterized by the absence of one X chromosome rather than the addition of an extra one. Therefore, the statements regarding Down syndrome and the general cause are accurate.

29. (C) It provides resistance to ultraviolet radiation damage.
Albinism is a genetic condition resulting from a lack of melanin, the pigment that protects skin from solar radiation. Individuals with albinism are actually more susceptible to ultraviolet damage and have a higher risk of skin cancer. The disorder is typically inherited in an autosomal recessive manner and affects the pigmentation of the skin, hair, and eyes, often causing vision problems.

30. (D) Turner syndrome
Turner syndrome is a chromosomal disorder occurring in females who possess only one functional X chromosome instead of two. This condition, represented as 45, X0, leads to various physical characteristics such as short stature and developmental issues. It is not caused by a single gene mutation like thalassemia or hemophilia but is the result of a complete or partial chromosomal loss.

31. (C) Reducing disease stigma and increasing screening rates.
Awareness campaigns in tribal districts play a vital role in educating the community about the nature of sickle cell anemia. By providing accurate information, these programs help reduce the social stigma often associated with genetic conditions. This leads to higher participation in screening programs, allowing for earlier diagnosis and better management, which significantly improves the quality of life for affected individuals.

32. (C) 50%
A female carrier of hemophilia has one normal X chromosome and one mutated X chromosome. When she has a son, she provides one of her X chromosomes, while the father provides a Y chromosome. There is a 50% chance the son will inherit the mutated X chromosome and be affected, and a 50% chance he will inherit the normal one and be unaffected.

33. (B) Permanent genetic editing of the defective gene.
Hydroxyurea is a widely used medication for sickle cell disease that works by increasing the production of fetal hemoglobin. This helps prevent red blood cells from sickling, thereby reducing painful crises and the need for transfusions. While highly effective as a treatment, it does not permanently alter or edit the patient's DNA, as that would require advanced gene therapy or CRISPR technology.

34. (A) P-2, Q-3, R-4, S-1
The geographical distribution of tribal districts in Madhya Pradesh follows specific divisional patterns. Mandla is centrally located within the Jabalpur Division, while Balaghat is situated in the Wainganga valley. Seoni is characterized by the Satpura plateau and Pench region, and Chhindwara lies on the southern border. Understanding these locations is essential for targeted health interventions and resource allocation for sickle cell management.

35. (A) I, II, III, and IV
Modern genetic testing raises several ethical concerns, including the potential for discrimination by insurers and employers based on genetic risks. Privacy of sensitive data and the psychological impact of learning about untreatable conditions are also significant issues. Furthermore, the possibility of using technology for eugenics or selecting specific traits in offspring sparks intense debate within the medical and broader scientific communities.

36. (A) Universal screening of those aged 0-40 in tribal areas.
The National Sickle Cell Anemia Elimination Mission 2047 emphasizes a proactive public health approach. A primary strategy involves the universal screening of individuals between

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birth and 40 years of age in high-burden tribal regions. This massive screening effort is designed to identify carriers and affected individuals, enabling early intervention, genetic counseling, and informed reproductive choices to reduce the disease's overall prevalence.

37. (A) To universally screen the tribal population for early detection and management
The primary goal of the Madhya Pradesh sickle cell screening programme is to identify affected individuals and carriers within the tribal population. Early detection allows healthcare providers to initiate management strategies that improve health outcomes and reduce complications. This public health approach focuses on empowerment through information and medical care, rather than coercive measures like relocation or mandatory sterilization of individuals.

38. (C) Statement I is correct but Statement II is incorrect
In the DNA double helix, the nitrogenous base Adenine always pairs with Thymine through two hydrogen bonds. Cytosine pairs with Guanine, but this pairing involves three hydrogen bonds, not two. These specific base-pairing rules are fundamental to the stability of the DNA molecule and ensure the accurate replication of genetic information during cell division and the process of protein synthesis.

39. (D) Two alpha chains and two beta chains
Normal adult hemoglobin, known as HbA, is a tetramer consisting of four globin subunits. It is specifically composed of two alpha-globin chains and two beta-globin chains. Each of these four subunits contains a heme group that binds to oxygen. This specific molecular structure is essential for the efficient transport of oxygen from the lungs to the various tissues of the human body.

40. (D) Marriage between two individuals carrying the trait.
Premarital screening in high-risk populations aims to identify whether prospective partners are both carriers of the sickle cell trait. If two carriers marry, there is a 25% chance with each pregnancy that their child will inherit sickle cell disease. By knowing their status, couples can receive genetic counseling and make informed decisions to prevent the birth of children with the severe disorder.

41. (B) It involves the substitution of valine for glutamic acid at the sixth position of the beta-globin chain.
Sickle cell anemia is caused by a specific point mutation in the HBB gene. This mutation results in the substitution of the amino acid valine for glutamic acid at the sixth position of the beta-globin protein chain. This single change alters the physical properties of the hemoglobin molecule, causing it to polymerize under low oxygen conditions and distort the red blood cell shape.

42. (A) P-3, Q-4, R-1, S-2
Genetic disorders arise from various molecular causes. Thalassemia involves an imbalance in globin chain synthesis, while Down syndrome results from trisomy 21. Phenylketonuria is caused by a specific enzyme deficiency, and color blindness is typically an X-linked recessive trait. Identifying these underlying mechanisms is crucial for accurate diagnosis, genetic counseling, and developing targeted treatments for patients and their families.

43. (B) Community mobilization → Initial mass screening → Confirmatory HPLC test → Counseling of positive cases
Executing a genetic screening camp requires a structured approach to ensure community participation and clinical accuracy. The process starts with community mobilization to raise awareness. This is followed by initial mass screening to identify potential cases. Positive results are then verified using confirmatory HPLC tests, and finally, affected individuals receive counseling to manage their condition effectively and understand their genetic status.

44. (D) Indian Council of Medical Research (ICMR)
The Indian Council of Medical Research is the premier national body for the formulation, coordination, and promotion of biomedical research in India. It plays a central role in establishing guidelines for the management of genetic diseases like sickle cell anemia. Through its research institutes and funding, ICMR provides the scientific evidence base required

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for effective national health policies and clinical practices.

45. (C) Immediately performing transplants in the first week.
Newborn screening for sickle cell anemia is essential for identifying affected infants early. This allows for the start of prophylactic treatments, such as penicillin, to prevent life-threatening infections. It also enables parents to receive genetic counseling. However, bone marrow transplantation is a complex procedure that is not performed immediately in the first week of life, as it requires careful preparation and matching.

46. (B) Mobilizing the community and providing basic counseling.
Tribal health workers like ASHAs play a critical role as a bridge between the community and the formal healthcare system. Their primary responsibilities in sickle cell management include raising awareness, mobilizing residents for screening camps, and providing basic counseling and support. They are not authorized to perform complex medical procedures or diagnostic tests, which remain the responsibility of trained clinical and laboratory staff.

47. (B) The trait cannot be passed on to the next generation if only one parent has it.
Sickle cell trait is inherited in an autosomal manner, meaning an individual with the trait has one mutated allele. Even if only one parent has the trait, they have a 50% chance of passing that mutated allele to their child. While these individuals are usually asymptomatic and have a normal life expectancy, they remain carriers who can transmit the gene to the next generation.

48. (C) Statement I is true but Statement II is false
Carrier testing is a vital genetic tool used to identify individuals who carry a single copy of a recessive gene mutation. Regarding sickle cell anemia, premarital screening is actively encouraged as a public health measure in Madhya Pradesh to help couples make informed reproductive choices. It is not discouraged, as it is a key component of the state's strategy to reduce disease burden.

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49. (A) Chromosome 16
Alpha thalassemia is a genetic blood disorder characterized by reduced production of alpha-globin chains. The genes responsible for producing these chains are located in a cluster on chromosome 16. Most cases of alpha thalassemia result from the deletion of one or more of these four genes. The severity of the condition depends on how many of these specific genes are missing or mutated.

50. (C) Leaf thickness
Gregor Mendel studied seven distinct traits in pea plants to establish the laws of inheritance. These included seed color, seed shape, flower color, flower position, pod color, pod shape, and stem height. Leaf thickness was not one of the characteristics he analyzed. By choosing clear, contrasting traits, Mendel was able to observe and record precise mathematical ratios in the offspring of his crosses.

51. (D) Jabalpur
The National Institute of Research in Tribal Health is a premier permanent research center of the Indian Council of Medical Research. Located in Jabalpur, Madhya Pradesh, it focuses on the health problems of tribal populations. NIRTH has been instrumental in conducting extensive research on the prevalence, molecular biology, and management of sickle cell anemia among the diverse tribal communities of the state.

52. (D) Assessing and communicating the risk of inherited disorders.
Genetic counseling is a communication process that helps individuals and families understand the medical, psychological, and familial implications of genetic contributions to disease. The primary purpose is to provide information about the risks of inheriting or passing on a disorder. This empowers prospective parents to make informed decisions about reproduction and healthcare, based on their personal values and the scientific evidence provided.

53. (C) It was originally discovered as an adaptive immune system in humans.
CRISPR technology is a revolutionary gene-editing tool derived from a natural defense mechanism found in bacteria and archaea, not humans. It uses a guide RNA to direct the Cas9

enzyme to a specific DNA sequence, where it creates a cut. This allows scientists to add, remove, or alter genetic material, offering tremendous potential for treating various genetic disorders at their molecular source.

54. (C) Dehydration and hypoxia
A sickle cell crisis is often triggered by physiological stressors that promote the sickling of red blood cells. Dehydration reduces blood volume and increases blood viscosity, while hypoxia, or low oxygen levels, causes hemoglobin S to polymerize. These conditions lead to the formation of rigid, crescent-shaped cells that block blood flow, resulting in the intense pain and tissue damage characteristic of a crisis.

55. (A) Turner syndrome
Sickle cell anemia, thalassemia, and cystic fibrosis are all examples of single-gene disorders caused by mutations in specific genes. Turner syndrome, however, is a chromosomal disorder resulting from the complete or partial absence of an X chromosome. This distinction in the underlying genetic cause—gene mutation versus chromosomal abnormality—sets Turner syndrome apart from the other conditions listed in the group of disorders.

56. (A) Requirement for an HLA-matched donor, typically a relative.
Bone marrow transplantation is currently the only known cure for sickle cell disease. For the procedure to be successful and to minimize the risk of rejection or graft-versus-host disease, the patient must have a donor with a matching Human Leukocyte Antigen type. A sibling is often the best candidate for a match. The procedure involves replacing the patient's defective hematopoietic stem cells.

57. (A) Both Statement I and Statement II are true
Gel electrophoresis is a standard laboratory technique used to separate molecules like proteins or DNA based on their size and electrical charge. In the context of sickle cell diagnosis, this method is used to differentiate between various types of hemoglobin. Because hemoglobin S has a different electrical charge than normal hemoglobin A, it moves at a different speed, allowing for clear identification.

58. (A) Altering or introducing genetic material into cells.
Gene therapy is an experimental technique that uses genetic material to treat or prevent disease. This can involve replacing a mutated gene with a healthy copy, inactivating a malfunctioning gene, or introducing a new gene to help the body fight a disorder. It represents a move toward curative treatments that address the underlying genetic cause of a disease rather than just symptoms.

59. (C) Turner syndrome – 45, X0
Chromosomal disorders are defined by specific numerical or structural anomalies. Turner syndrome is characterized by the presence of only one X chromosome in females, denoted as 45, X0. In contrast, Down syndrome is trisomy 21, and Klinefelter syndrome is 47, XXY. Patau syndrome involves an extra copy of chromosome 13. Correctly identifying these pairs is essential for clinical diagnosis and understanding genetic inheritance.

60. (B) Targeted resources for disproportionately affected groups.
Linking sickle cell screening with tribal welfare policy in Madhya Pradesh ensures that healthcare resources are directed toward the communities most affected by the disease. This targeted approach allows for more efficient use of public health funds and provides specialized care to vulnerable populations. It acknowledges the unique demographic distribution of the gene and seeks to reduce health disparities through focused intervention.

61. (C) Autosplenectomy or functional loss of the spleen.
In sickle cell disease, the spleen often becomes clogged with sickled red blood cells, leading to repeated infarctions or tissue death. Over time, this damage causes the spleen to shrink and lose its ability to function, a process known as autosplenectomy. Since the spleen is vital for filtering the blood and fighting certain infections, its loss significantly increases the patient's vulnerability to pathogens.

62. (A) A simple outpatient procedure without hospitalization.
Bone marrow transplantation is a highly complex and intensive medical procedure that requires

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prolonged hospitalization. It involves high-dose chemotherapy to destroy the patient's existing marrow before infusing donor stem cells. The process carries significant risks, such as graft-versus-host disease and severe infections. Furthermore, finding a perfectly matched donor remains a major challenge, limiting the availability of this potentially curative treatment for many.

63. (A) Viruses
In gene therapy, modified viruses are the most common vectors used to deliver therapeutic genes into a patient's cells. Scientists remove the viral genes that cause disease and replace them with the healthy human gene. These engineered viruses then use their natural ability to enter cells to deliver the genetic payload. This approach leverages biological efficiency to correct or compensate for genetic mutations.

64. (C) Statement I is correct but Statement II is incorrect
Hemophilia B is caused by a deficiency in clotting factor IX, whereas Hemophilia A involves factor VIII. While both conditions lead to similar symptoms like prolonged bleeding and joint pain, they cannot be distinguished by physical examination alone. Accurate diagnosis requires specific laboratory blood tests to measure the levels of individual clotting factors, which is essential for determining the correct replacement therapy.

65. (A) Every affected individual must have at least one affected parent.
Autosomal dominant inheritance is characterized by the appearance of the trait in every generation of an affected family. Because only one copy of the mutated gene is needed to express the disorder, an affected child must have inherited the gene from at least one affected parent. In this pattern, there are no asymptomatic carriers, and both males and females are affected with equal frequency.

66. (B) II and IV
Mendel's Law of Independent Assortment was developed based on dihybrid crosses, which observe two traits simultaneously. The law states that alleles for different traits are distributed to gametes independently. However, this rule does not apply to genes that are physically close to each other on the same chromosome, as they tend to be inherited together. Therefore, the statements regarding monohybrid crosses and linked genes are incorrect.

67. (C) Increasing fetal hemoglobin levels to prevent sickling.
Hydroxyurea is a primary pharmacological treatment for sickle cell disease. It works by stimulating the production of fetal hemoglobin, which is present in infants but normally decreases after birth. Fetal hemoglobin interferes with the polymerization of hemoglobin S, the process that causes red blood cells to sickle. By increasing these levels, the drug reduces the frequency of painful crises and other severe complications.

68. (A) Both Statement I and Statement II are true
Vaso-occlusive crises are the most frequent reason for hospital visits for individuals with sickle cell disease. They occur when rigid, sickle-shaped red blood cells become trapped in the microvasculature, obstructing blood flow. This blockage leads to ischemia, a lack of oxygen in the tissues, which causes intense pain and can eventually lead to tissue death and permanent damage to vital organs.

69. (A) 1, 3, 5, 2, 4
During a sickle cell crisis, physiological events unfold in a specific order starting with a drop in oxygen levels. This triggers mutant hemoglobin molecules to polymerize into fibers, causing red blood cells to distort into a sickle shape. These cells then clump together to block capillaries, leading to tissue ischemia and the onset of severe pain. Understanding this sequence is vital for management.

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70. (C) Tyrosinase
Albinism is a group of inherited disorders characterized by little or no production of the pigment melanin. This is most commonly caused by a defect in the enzyme tyrosinase, which is essential for the first step of melanin synthesis. The lack of pigment affects the development and appearance of the skin, hair, and eyes, and often leads to increased sensitivity to light.

71. (A) XY
In humans, biological sex is determined by the 23rd pair of chromosomes, known as the sex chromosomes. A normal male possesses one X chromosome and one Y chromosome, represented as the XY complement. Females, in contrast, typically possess two X chromosomes. This chromosomal organization is established at the moment of fertilization and determines the development of male or female primary sexual characteristics.

72. (C) Statement I is correct but Statement II is incorrect
Eugenics remains a major ethical concern in genetics because it involves the controversial idea of improving the genetic quality of a population. However, germline gene therapy is actually more controversial than somatic cell therapy. This is because germline changes are passed on to future generations, raising profound ethical, social, and safety questions that do not apply to therapies affecting only an individual patient's body cells.

73. (D) Hemolysis of fragile sickle cells releasing bilirubin.
Jaundice in sickle cell patients is primarily caused by the rapid breakdown of abnormal red blood cells, a process known as hemolysis. Because sickle cells are fragile and have a short lifespan, they rupture easily, releasing large amounts of hemoglobin into the bloodstream. This hemoglobin is broken down into bilirubin, a yellow pigment. If the liver cannot process bilirubin quickly enough, it accumulates, causing jaundice.

74. (A) 25%
When two individuals with the sickle cell trait (HbAS) have a child, each parent has a 50% chance of passing on the mutated allele. According to Mendelian genetics, there is a 25% probability that the child will inherit a normal gene from both parents, a 50% probability of being a carrier like the parents, and a 25% probability of inheriting both mutated genes.

75. (D) Type 2 Diabetes Mellitus
Type 2 Diabetes Mellitus is a classic example of a multifactorial disorder. Its development is influenced by a combination of multiple genetic predispositions and various lifestyle and environmental factors, such as diet and physical activity levels. Unlike single-gene disorders like hemophilia or sickle cell anemia, which follow clear inheritance patterns, multifactorial conditions result from the cumulative effect of many small genetic and external influences.

76. (A) Both A and R are true and R is the correct explanation of A.
Consanguineous marriages, or marriages between close relatives, increase the risk of offspring inheriting autosomal recessive disorders. This is because relatives are more likely than unrelated individuals to carry the same rare, recessive mutations inherited from a common ancestor. When two such carriers reproduce, there is a significantly higher probability that their children will receive two copies of the mutant gene and express the disorder.

77. (D) Thalassemia Major requires lifelong blood transfusions, whereas Minor typically requires no specific treatment.
Thalassemia is classified based on the severity of the symptoms and the genetic makeup of the individual. Thalassemia Major is a severe form where the person inherits two mutated genes, leading to severe anemia that requires regular blood transfusions and medical care. Thalassemia Minor, or the carrier state, involves only one mutated gene. These individuals usually have mild or no symptoms and require no treatment.

78. (A) I and II
Phenylketonuria is an autosomal recessive metabolic disorder. Without treatment, the accumulation of phenylalanine leads to severe intellectual disabilities. However, the management of the condition requires a strict reduction in dietary phenylalanine intake, not an increase. By limiting high-protein foods and using specialized medical formulas, affected individuals can lead healthy lives and prevent the neurological damage associated with the untreated form of the disease.

79. (B) In Vitro Fertilization (IVF)
Pre-implantation genetic diagnosis is an advanced technique used to screen embryos for specific genetic disorders before they are implanted in the uterus. This procedure is performed as part of an in vitro fertilization cycle. By testing a few

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cells from the embryo, doctors can identify those that do not carry a particular mutation, allowing couples at risk to have children free of certain genetic conditions.

80. (A) P-2, Q-4, R-1, S-3
Karyotyping (chromosomes), PGD (IVF), Electrophoresis (proteins), and Pedigree analysis (family trees) are all essential tools in genetics. Karyotyping visualizes chromosomal structure, while electrophoresis separates proteins like hemoglobin. Pedigree analysis tracks traits through families, and PGD screens embryos during IVF. These diverse applications allow clinicians to diagnose disorders, predict inheritance risks, and provide comprehensive care to individuals and families affected by genetic conditions.

81. (C) Insertion or deletion of nucleotides not divisible by three.
A frameshift mutation occurs when nucleotides are inserted into or deleted from a DNA sequence in a number that is not a multiple of three. Because the genetic code is read in triplets, or codons, such an alteration shifts the entire reading frame of the gene. This usually results in a completely different and often nonfunctional protein being produced, often leading to severe genetic disorders.

82. (A) The sickle cell gene is completely absent in the Gond and Bhil communities.
The sickle cell gene is actually highly prevalent among the Gond and Bhil communities in Madhya Pradesh. As the state with the largest tribal population in India, MP faces a significant public health challenge from this disease. Government programs specifically target these high-burden communities through screening and management initiatives, integrating specialized genetic care with broader rural health missions to improve health outcomes.

83. (D) DNA Double Helix Structure – Watson and Crick
James Watson and Francis Crick are famously credited with determining the double helix structure of DNA in 1953, using data from Rosalind Franklin and Maurice Wilkins. This discovery was a landmark in biology, explaining how genetic information is stored and copied. Other options pair researchers with the wrong discoveries; for example, Mendel is the father of genetics, while PCR was developed by Kary Mullis.

84. (C) National Health Mission (NHM)
The National Health Mission is a major government initiative that provides the framework and funding for strengthening healthcare systems across India. Madhya Pradesh's sickle cell management programs operate within this broader mission, utilizing its infrastructure for screening, training health workers, and providing care in rural areas. This integration ensures that genetic disease management is part of the state's comprehensive public health strategy for vulnerable populations.

85. (C) Uncontrolled bleeding.
Sickle cell anemia is characterized by anemia, jaundice, and painful episodes such as dactylitis, which is the swelling of hands and feet. Uncontrolled bleeding is not a typical feature of sickle cell disease; rather, it is the hallmark symptom of hemophilia, a different group of genetic blood disorders. Distinguishing these symptoms is important for the correct clinical diagnosis and management of patients with inherited blood conditions.

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86. (B) Reverse transcriptase enzyme.
A functional CRISPR-Cas9 system requires three main components: the Cas9 nuclease enzyme to cut DNA, a guide RNA to target a specific sequence, and the target DNA itself. Reverse transcriptase is an enzyme used by retroviruses to convert RNA into DNA and is commonly used in laboratory techniques to create cDNA. It is not a primary component of the standard CRISPR gene-editing mechanism.

87. (B) Vision is normal, but carrier.
Because red-green color blindness is an X-linked recessive trait, a female with one mutated allele and one normal allele is a heterozygous carrier. Her normal allele provides sufficient function for her to have normal vision. However, she can pass the mutated gene to her children. For a female to be color blind, she must inherit two copies of the mutated gene, one from each parent.

CHAPTER 07

Health Policy, National and State Health Programmes

1. Match the health committees in List I with the year of their primary report submission in List II and select the correct option.
List I: (Health Committee)
P. Bhore Committee
Q. Mudaliar Committee
R. Chadha Committee
S. Kartar Singh Committee
List II: (Year of Report Submission)
1. 1973
2. 1963
3. 1962
4. 1946
(A) P-1, Q-2, R-3, S-4
(B) P-4, Q-2, R-3, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-3, R-2, S-1

2. Under the National Tuberculosis Elimination Programme, what is the target year set by the Government of India to achieve a TB-free India?
(A) 2023
(B) 2025
(C) 2027
(D) 2030

3. What is the primary target set by the National Health Policy 2017 regarding public health expenditure in India?
(A) Increase it to 1.5 percent of GDP by 2022
(B) Increase it to 2.5 percent of GDP by 2025
(C) Increase it to 3.0 percent of GDP by 2030
(D) Increase it to 4.0 percent of GDP by 2025

4. Deen Dayal Antyodaya Upchar Yojana was implemented in Madhya Pradesh to provide free medical treatment up to a specified limit for which target group?
(A) All state government employees
(B) Non-resident Indians visiting the state
(C) Below Poverty Line families
(D) Employees of multinational corporations

5. Read the following statements regarding the roles of an Accredited Social Health Activist (ASHA) worker.
I. Creating awareness about health and mobilizing the community towards local health planning.
II. Performing major surgical interventions at the sub-centre level independently.
III. Facilitating access to immunization, antenatal care, and postnatal care.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

6. Match the public health facility in List I with its ideal population coverage norm in plain rural areas in List II and select the correct option.
List I: (Public Health Facility)
P. Sub-Health Centre
Q. Primary Health Centre
R. Community Health Centre
S. District Hospital
List II: (Ideal Population Coverage Norm)
1. Population of 1,20,000
2. Population of 30,000
3. Population of 5,000
4. Serves the entire district population
(A) P-1, Q-2, R-3, S-4
(B) P-3, Q-2, R-1, S-4
(C) P-3, Q-1, R-2, S-4
(D) P-2, Q-3, R-1, S-4

7. Which prominent committee, established in 1946, is often regarded as the foundational framework for the evolution of public health policy in post-independence India?
(A) Mudaliar Committee

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epicanthic folds, a single palmar crease across the hand, a flat facial profile, and varying degrees of intellectual disability. Uncontrollable bleeding is not associated with this chromosomal condition. Recognizing these signs early allows for supportive interventions that can help individuals with Down syndrome reach their full potential.

97. (A) Gene therapy is a cheap treatment for rural centers.
Gene therapy is currently one of the most expensive and technologically demanding medical treatments available. It requires specialized laboratory facilities, highly trained personnel, and sophisticated delivery systems. While it offers the hope of a permanent cure for genetic diseases, its high cost and complexity remain major barriers to its widespread implementation, particularly in rural or resource-limited healthcare settings in developing countries.

98. (A) P-3, Q-1, R-4, S-2
Premarital (couples), Newborn (infants), Therapy (cure), and Counseling (families) represent distinct but complementary genetic interventions. Premarital screening identifies carrier status in couples, while newborn screening ensures early detection in infants. Gene therapy seeks a permanent cure at the DNA level, and genetic counseling assists families in understanding their risks. Together, these strategies form a comprehensive framework for the diagnosis, prevention, and treatment of genetic disorders.

99. (D) Dindori – Maikal Range
Dindori is a district in Madhya Pradesh with a high sickle cell burden and is geographically characterized by the Maikal Range. This range is part of the eastern Satpura hills and is home to many tribal communities. Understanding the intersection of geography and demography is crucial for health planning, as it helps in designing and delivering medical services to remote populations living in these rugged regions.

100. (A) Universal mass screening → Issuance of color-coded sickle cell cards → Genetic counseling of carriers → Targeted prenatal diagnosis
The operational strategy of the National Sickle Cell Anemia Elimination Mission follows a logical progression of interventions. It begins with universal mass screening for early detection, followed by the issuance of color-coded sickle cell cards. Subsequently, genetic counseling is provided to carriers, and targeted prenatal diagnosis is offered to manage the reproductive risk within families, aiming for long-term reduction in the disease's prevalence.

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36. National Urban Health Mission specifically aims to address the health concerns of which demographic group?
(A) Urban poor population residing in listed and unlisted slums
(B) High-income corporate executives in metropolitan cities
(C) Rural farmers migrating to foreign countries for work
(D) Residents of purely agricultural belts near urban centers

37. Under the National Mental Health Programme, what is the primary focus of the District Mental Health Programme?
(A) Integrating mental health with general health care at the district level
(B) Constructing large specialized asylums in every administrative district
(C) Providing exclusive online therapy sessions for urban youth populations
(D) Funding psychiatric research projects in foreign medical universities

38. Under the Ayushman Bharat scheme, secondary and tertiary care hospitalization is governed by which specific component?
(A) Health and Wellness Centres
(B) National Urban Health Mission
(C) e-Sanjeevani Tele-platform
(D) Pradhan Mantri Jan Arogya Yojana

39. The National Health Policy 2017 advocates for moving away from sick care to wellness. This is fundamentally implemented through which mechanism?
(A) Expanding private health insurance coverage networks
(B) Abolishing the National Health Mission framework
(C) Centralizing all health services in the national capital
(D) Upgrading Sub-Centres into Health and Wellness Centres

40. Which of the following diseases is considered the target of elimination under a specific national health programme aiming for a case rate of less than 1 per 10,000 population?
(A) Tuberculosis
(B) HIV/AIDS
(C) Dengue
(D) Leprosy

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41. The financial assistance under the Pradhan Mantri Matru Vandana Yojana is provided subject to fulfilling specific conditions. Which of the following is not one of those conditions?
(A) Early registration of pregnancy
(B) Mandatory sterilization of the husband
(C) Ante-natal check-up
(D) Registration of the birth of the child

42. Identify the most appropriate reason for the persistence of health infrastructure gaps in the tribal areas of Madhya Pradesh.
(A) Excessive overpopulation of tribal regions compared to urban centers
(B) Complete absence of traditional medicine usage among tribal groups
(C) Geographical isolation and lack of adequate transport connectivity
(D) Over-availability of private tertiary hospitals in remote forests

43. Match the Madhya Pradesh state health schemes in List I with their key provisions in List II and select the correct option.
List I: (Madhya Pradesh State Health Scheme)
P. Mukhyamantri Bal Hridaya Upchar Yojana
Q. Deen Dayal Antyodaya Upchar Yojana
R. Mukhyamantri Swasthya Bima Yojana
S. Sardar Vallabh Bhai Patel Free Drug Distribution
List II: (Key Provision)
1. Health insurance coverage for families
2. Free heart surgery for children
3. Free medicines in all government health facilities
4. Free treatment for BPL families up to a set financial limit
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-4, R-1, S-3
(C) P-4, Q-3, R-2, S-1
(D) P-2, Q-1, R-4, S-3

44. Consider the following public health programmes in India.
1. National Rural Health Mission
2. Pradhan Mantri Matru Vandana Yojana
3. Ayushman Bharat Digital Mission
4. Mission Indradhanush

(B) Bhore Committee
(C) Chadha Committee
(D) Kartar Singh Committee

8. What is the exact monetary benefit provided to eligible pregnant women and lactating mothers under the Pradhan Mantri Matru Vandana Yojana?
(A) Rupees 3,000 in two installments
(B) Rupees 5,000 in three installments
(C) Rupees 6,000 in a single installment
(D) Rupees 10,000 in five installments

9. Read the following statements regarding the National Leprosy Eradication Programme.
I. It aims to eliminate leprosy as a public health problem.
II. Elimination is defined as a prevalence rate of less than 1 case per 10,000 population.
III. The programme discontinued the use of Multi-Drug Therapy due to severe side effects.
IV. ASHA workers are involved in bringing suspected leprosy cases to primary health centres.
Which of the above statement(s) is/are incorrect?
(A) I and II
(B) II and III
(C) III only
(D) I and IV

10. Identify the correct statement regarding the National Health Mission.
(A) It was launched originally in 1995 to target vector-borne diseases throughout the country
(B) It focuses solely on expanding medical colleges in metropolitan cities and urban centres
(C) It comprises sub-missions for the National Rural Health and National Urban Health Missions
(D) It is a purely state-funded scheme that receives no central financial assistance from the union

11. What is the length of the unique Health ID number generated under the Ayushman Bharat Digital Mission?
(A) 10 digits
(B) 12 digits
(C) 14 digits
(D) 16 digits

12. The concept of Universal Health Coverage implies which of the following best descriptions?
(A) Providing highly specialized surgeries free of cost specifically for urban populations
(B) Mandating every citizen to purchase private health insurance policies for basic care
(C) Accessing necessary health services without experiencing financial hardship
(D) Restricting health care access to below poverty line families on an exclusive basis

13. Mission Indradhanush was launched by the Government of India primarily to address which public health concern?
(A) Achieving full immunization for children and pregnant women
(B) Enhancing mental health awareness in public schools
(C) Expanding the network of primary health centres
(D) Providing teleconsultation to remote villages

14. What is the standard population norm for the selection of one ASHA worker in rural areas under normal geographic conditions?
(A) One ASHA per 500 population
(B) One ASHA per 1000 population
(C) One ASHA per 2000 population
(D) One ASHA per 5000 population

15. The State Institute of Health and Family Welfare in Madhya Pradesh is headquartered in which city?
(A) Indore
(B) Gwalior
(C) Jabalpur
(D) Bhopal

16. Read the following statements regarding the National Health Policy 1983.
Statement I: It was the first National Health Policy of India and aimed to achieve Health for All by the year 2000.
Statement II: It completely shifted the focus from primary health care to establishing private tertiary care hospitals across the country.
Identify the correct option:

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88. (B) Severe mental retardation
Turner syndrome is characterized by physical features such as short stature, a webbed neck, and gonadal dysgenesis, which leads to infertility. While some individuals may experience specific learning disabilities, severe mental retardation is not a typical feature of the condition. Most women with Turner syndrome have normal intelligence and can lead full, productive lives with appropriate medical management of their physical symptoms and hormonal needs.

89. (B) Developing antibiotics targeting bacterial cell walls.
CRISPR technology has a wide range of potential applications, including correcting genetic mutations, improving crop resistance, and engineering immune cells for cancer therapy. However, developing traditional antibiotics that target bacterial cell walls is a different field of pharmacology and microbiology that does not typically involve genome editing. CRISPR is more likely to be used to create specialized "programmable" antibiotics that target specific bacterial DNA sequences.

90. (A) Dindori
Dindori is a district in Madhya Pradesh recognized for having a very high prevalence of sickle cell anemia among its tribal population. This high concentration is due to the genetic demographic profile of the local communities. As a result, Dindori is a primary focus for state-led screening and management programs. Urban centers like Bhopal or Gwalior do not show the same high density of this genetic disorder.

91. (D) Statement I is incorrect but Statement II is true
In the context of public health ethics and policy, genetic counseling remains a voluntary process focused on informed consent rather than a legally mandated requirement. Maintaining strict confidentiality regarding an individual's genetic data is a fundamental ethical pillar of the profession. This ensures that patients feel secure while sharing sensitive family information without fear of discrimination based on their genetic status or inheritance risks.

92. (C) Thymine
At the molecular level, the sickle cell mutation is a single nucleotide polymorphism in the HBB gene. In the specific codon affected, the nitrogenous base Adenine is replaced by Thymine. This change in the DNA template alters the resulting mRNA and leads to the substitution of valine for glutamic acid in the beta-globin protein, fundamentally changing the hemoglobin molecule's behavior and physical properties.

93. (D) Aneuploidy (abnormal chromosome count).
Non-disjunction is an error that occurs during meiosis when homologous chromosomes or sister chromatids fail to separate properly. This leads to gametes with an abnormal number of chromosomes. When these gametes participate in fertilization, the resulting zygote has an abnormal chromosome count, a condition known as aneuploidy. Familiar examples of aneuploidy include Down syndrome, Turner syndrome, and Klinefelter syndrome, each with distinct clinical effects.

94. (C) Prohibited due to unknown effects on future offspring.
The Indian Council of Medical Research guidelines currently prohibit germline gene therapy in India. This is because any changes made to the germline would be inherited by all future generations, and the long-term biological and ethical consequences are not yet fully understood. While somatic cell gene therapy is permitted under strict regulation, the permanent alteration of the human gene pool remains an international ethical boundary.

95. (A) Iron overload.
Patients with severe sickle cell anemia or thalassemia often require regular blood transfusions to maintain healthy hemoglobin levels. Each unit of blood contains a significant amount of iron, which the body has no natural way to excrete. Over time, this iron accumulates in vital organs like the heart and liver, leading to organ damage. To prevent this, patients must often undergo chelation therapy.

96. (A) I, II, III, and V
Down syndrome is clinically identified by a combination of physical and developmental features. These include slanted eyes with

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(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

26. Which of the following is an incorrect statement regarding the National Health Policy 2002?
(A) It emphasized the eradication of polio and yaws
(B) It aimed to increase the integration of AYUSH systems into mainstream healthcare
(C) It highlighted the need to decentralize public health administration
(D) It set a definitive target to privatize all rural health care infrastructure by 2010

27. In the district health administration structure of Madhya Pradesh, who acts as the primary administrative head for public health services?
(A) Chief Medical and Health Officer
(B) District Collector and Magistrate
(C) Sub-Divisional District Magistrate
(D) Block Medical and Health Officer

28. The National Rural Health Mission was officially launched in India in which year?
(A) 2000
(B) 2005
(C) 2010
(D) 2014

29. Which disease is not covered under the National Vector Borne Disease Control Programme?
(A) Malaria
(B) Dengue
(C) Measles
(D) Japanese Encephalitis

30. Identify the incorrect pair regarding health schemes and their target beneficiaries.
(A) Janani Suraksha Yojana - Pregnant women
(B) Rashtriya Bal Swasthya Karyakram - Children from birth to 18 years
(C) Mission Indradhanush - Partially vaccinated or unvaccinated children and pregnant women
(D) Pradhan Mantri Matru Vandana Yojana - Senior citizens above 60 years

31. Which model is commonly used in Madhya Pradesh to manage diagnostic services such as CT scans and MRI facilities in district hospitals?
(A) Direct state monopoly
(B) Complete privatization without regulation
(C) Public Private Partnership
(D) Non-Governmental Organization charity model

32. Read the following statements regarding the health sector in the Constitution of India.
Statement I: Public health and sanitation, hospitals and dispensaries fall under the State List of the Seventh Schedule.
Statement II: Population control and family planning fall under the Concurrent List.
Identify the correct option:
(A) Statement I is correct and Statement II is incorrect
(B) Statement I is incorrect and Statement II is correct
(C) Both Statement I and Statement II are correct
(D) Both Statement I and Statement II are incorrect

33. The Pradhan Mantri Surakshit Matritva Abhiyan guarantees a minimum package of antenatal care services to pregnant women on which specific day of every month?
(A) 1st
(B) 9th
(C) 15th
(D) 25th

34. What is the designated first point of contact between the primary health care system and the rural community for curative healthcare under standard guidelines?
(A) District Hospital
(B) Medical College Hospital
(C) Tertiary Care Specialty Centre
(D) Sub-Health Centre

35. Find the odd one out among the vector-borne diseases addressed by the National Vector Borne Disease Control Programme.
(A) Cholera
(B) Malaria
(C) Chikungunya
(D) Kala-Azar

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(A) Statement I is correct and Statement II is incorrect
(B) Statement I is incorrect and Statement II is correct
(C) Both Statement I and Statement II are correct
(D) Both Statement I and Statement II are incorrect

17. Mukhyamantri Bal Hridaya Upchar Yojana in Madhya Pradesh is specifically designed to provide which of the following?
(A) Free heart surgery for children with congenital diseases
(B) Free spectacles for children suffering from visual impairment
(C) Monthly nutritional stipends for children diagnosed with malnutrition
(D) Free psychological counseling for school children in government sectors

18. What is the primary objective of establishing Health and Wellness Centres under the Ayushman Bharat scheme?
(A) Providing comprehensive primary health care including maternal and child health
(B) Replacing existing district hospitals with specialized clinical hubs across the region
(C) Acting exclusively as COVID-19 vaccination centres for local urban populations
(D) Serving as administrative offices for health insurance enrollment for eligible citizens

19. Which of the following web-based portals is utilized for monitoring and tracking tuberculosis patients under the National Tuberculosis Elimination Programme?
(A) e-Sanjeevani
(B) CoWIN
(C) Arogya Setu
(D) Nikshay

20. The Janani Shishu Suraksha Karyakram guarantees which of the following free entitlements to pregnant women accessing public health institutions?
(A) Free cashless delivery including Caesarian section
(B) Free lifetime health insurance for the entire family
(C) Free house construction material for below poverty line mothers
(D) Free higher education for the newborn child

21. Which initiative serves as the national telemedicine service launched by the Ministry of Health and Family Welfare, widely used in Madhya Pradesh for e-health?
(A) e-RaktKosh
(B) e-Charak
(C) e-Sanjeevani
(D) e-Aushadhi

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22. Ayushman Bharat Pradhan Mantri Jan Arogya Yojana provides a health cover of what amount per family per year?
(A) Rupees 1 lakh
(B) Rupees 3 lakhs
(C) Rupees 5 lakhs
(D) Rupees 10 lakhs

23. Which of the following components does not fall under the purview of the National Urban Health Mission?
(A) Upgrading urban primary health centres
(B) Deployment of Urban ASHAs
(C) Formation of Mahila Arogya Samitis
(D) Establishing agricultural subsidies

24. What are the 4Ds targeted for early identification and intervention under the Rashtriya Bal Swasthya Karyakram?
(A) Dengue, Diphtheria, Dysentery, and Diabetes symptoms
(B) Diet, Discipline, Development, and Disease patterns
(C) Diagnosis, Drugs, Doctors, and Dispensary management
(D) Birth defects, diseases, deficiencies, and delays

25. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Select the correct option.
Assertion (A): India was declared polio-free by the World Health Organization in 2014.
Reason (R): The Pulse Polio Immunization programme achieved 100 percent coverage and zero new cases were reported for three consecutive years prior to certification.
(A) Both A and R are true and R is the correct explanation of A.

Which of the following represents the correct chronological order of their launch?
(A) 1, 4, 2, 3
(B) 1, 2, 4, 3
(C) 4, 1, 3, 2
(D) 2, 1, 4, 3

45. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R). Select the correct option.
Assertion (A): The infant mortality rate and maternal mortality ratio in tribal districts of Madhya Pradesh often remain higher than the state average.
Reason (R): Tribal areas frequently suffer from deficits in specialized medical personnel, tough terrain, and lower health awareness.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

46. Which of the following is an incorrect statement regarding the National Programme for Control of Blindness?
(A) Launching a 100 percent centrally sponsored scheme
(B) Providing free sunglasses to the general public
(C) Focusing on cataract surgery as a major component
(D) Reducing the prevalence of blindness across the nation

47. Which of the following best describes the cause and effect relationship associated with the introduction of the Janani Suraksha Yojana?
(A) Decrease in cash incentives provided and rise in maternal mortality
(B) Conditional cash transfers and institutional deliveries
(C) Abolition of traditional birth attendants and reduction in hospital births
(D) Introduction of mandatory hospital fees and safe motherhood indices

48. Choose the correct sequential arrangement of health facilities forming the referral chain from the community level upwards:
(A) District Hospital - Community Health Centre - Primary Health Centre - Sub-Centre
(B) Sub-Centre - Primary Health Centre - Community Health Centre - District Hospital
(C) Primary Health Centre - Sub-Centre - District Hospital - Community Health Centre
(D) Community Health Centre - Primary Health Centre - Sub-Centre - District Hospital

49. What does the acronym RNTCP, the predecessor to the National Tuberculosis Elimination Programme, stand for?
(A) Revised National Tuberculosis Control Programme
(B) Regional Network for Tuberculosis Control and Prevention
(C) Rashtriya Nirman Tuberculosis Control Project
(D) Rural Network for Tuberculosis Care Provision

50. What is the main objective of the Poshan Maah campaign generally conducted in September every year?
(A) Promoting cash crops farming throughout the tribal regions
(B) Conducting mass cataract surgeries in remote rural villages
(C) Awareness about maternal, infant, and young child nutrition
(D) Distributing free smartphones to all rural ASHA workers

51. The total number of vaccines covered initially under the launch phase of Mission Indradhanush was:
(A) Five
(B) Seven
(C) Nine
(D) Twelve

52. What is the primary significance of establishing the All India Institute of Medical Sciences (AIIMS) in Bhopal?
(A) Manufacturing generic medicines for state-wide distribution
(B) Serving as an exclusive hospital for state cabinet ministers

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that provides free surgical treatment for children suffering from congenital heart diseases. The state government covers the full cost of diagnosis and cardiac procedures in both government and empanelled private hospitals. This life-saving scheme ensures that financial constraints do not prevent children from receiving necessary heart care.

18. (A) Providing comprehensive primary health care including maternal and child health
Health and Wellness Centres represent a critical pillar of the Ayushman Bharat scheme, designed to deliver comprehensive primary healthcare services close to the community. These centers expand the traditional scope of primary care to include non-communicable diseases, mental health, and palliative care, alongside maternal and child health. They focus on wellness and prevention rather than just treating illness after it occurs.

19. (D) Nikshay
Nikshay is the centralized web-based portal used by the National Tuberculosis Elimination Programme to track and monitor tuberculosis patients across India. It facilitates case notification, monitors treatment adherence, and manages the disbursement of financial incentives through Direct Benefit Transfer. This digital tool is essential for public health officials to maintain accurate records and ensure successful treatment outcomes for all registered patients.

20. (A) Free cashless delivery including Caesarian section
The Janani Shishu Suraksha Karyakram provides a guarantee of free, cashless delivery services for pregnant women in all public health institutions. This comprehensive entitlement includes free drugs, diagnostics, diet during stay, and blood if required. It also covers both normal deliveries and Caesarean sections, as well as free transport between home and the facility to eliminate all out-of-pocket medical expenses.

21. (C) e-Sanjeevani
e-Sanjeevani is a national telemedicine service that provides virtual consultations between patients and doctors, as well as doctor-to-doctor interactions. Extensively utilized in Madhya Pradesh, it allows individuals in remote areas to access specialist medical advice without traveling long distances. This digital platform has revolutionized healthcare delivery by leveraging technology to bridge the gap between rural communities and urban healthcare experts.

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22. (C) Rupees 5 lakhs
The Ayushman Bharat Pradhan Mantri Jan Arogya Yojana is a flagship scheme providing an annual health cover of five lakh rupees per family. This financial protection is designed for secondary and tertiary care hospitalization across public and empaneled private hospitals. By targeting over ten crore vulnerable families, it aims to reduce catastrophic out-of-pocket expenditure and promote equitable access to healthcare.

23. (D) Establishing agricultural subsidies
The National Urban Health Mission focuses on improving the health status of the urban poor through better primary healthcare services. Its key components include upgrading urban primary health centers, deploying Urban Accredited Social Health Activists, and forming Mahila Arogya Samitis for community mobilization. Establishing agricultural subsidies is entirely unrelated to this health mission, as it falls under the purview of agriculture departments.

24. (D) Birth defects, diseases, deficiencies, and delays
The Rashtriya Bal Swasthya Karyakram focuses on early identification and intervention for children from birth up to eighteen years of age. It specifically targets the 4Ds: birth defects, common childhood diseases, nutritional deficiencies, and developmental delays, including disabilities. By screening children at Anganwadi centers and schools, the program ensures timely medical management and reduces the long-term burden of these conditions.

25. (A) Both A and R are true and R is the correct explanation of A.
India successfully achieved polio-free status in 2014 after reporting zero cases for three consecutive years. This milestone was made possible by the rigorous implementation of the Pulse Polio Immunization programme, which ensured high coverage across the nation. The consistent absence of the virus during the

long distances to cities

61. The concept of creating an ABHA (Ayushman Bharat Health Account) number is primarily linked to which digital initiative?
(A) e-RaktKosh National Portal
(B) CoWIN Vaccination Platform
(C) Ayushman Bharat Digital Mission
(D) National Telemedicine Service

62. What does the term 'Out-of-Pocket Expenditure' refer to in the context of health economics and the National Health Policy?
(A) Direct payment made by individuals to healthcare providers
(B) Funding provided by the government to private hospitals
(C) Budget allocated by the state government for building hospitals
(D) Foreign aid received by the country for health initiatives

63. Under the National Leprosy Eradication Programme, reconstructive surgeries for leprosy-affected persons are provided to address which issue?
(A) Correction of deformities caused by the disease
(B) Cosmetic enhancement of unaffected body parts
(C) Weight loss management for obese patients
(D) Visual impairment correction for all cases

64. The cash incentive provided under the Janani Suraksha Yojana varies based on which classification?
(A) Differences between male and female children born in hospitals
(B) Variations between different caste categories across the states
(C) Classification of state performance and rural/urban areas
(D) Age of the mother at the time of her first hospital delivery

65. Find the odd one out in relation to maternal health schemes in India.
(A) Rashtriya Bal Swasthya Karyakram
(B) Pradhan Mantri Surakshit Matritva Abhiyan
(C) Janani Shishu Suraksha Karyakram
(D) Janani Suraksha Yojana

66. Consider the following landmark national policies and declarations related to health.
1. Alma-Ata Declaration on Primary Health Care
2. First National Health Policy of India
3. National Health Policy introducing Universal Health Coverage goals
4. Second National Health Policy of India

Which of the following represents the correct chronological sequence of their formulation?
(A) 1, 2, 4, 3
(B) 2, 1, 3, 4
(C) 1, 3, 2, 4
(D) 2, 4, 1, 3

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67. Read the following statements regarding the National Health Mission (NHM).
I. NHM attempts to achieve universal access to equitable, affordable, and quality health care.
II. NHM completely excludes communicable disease control programmes from its mandate.
III. NHM includes interventions to improve maternal and child health.

Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

68. Identify the incorrect statement regarding the setup of medical colleges in Madhya Pradesh.
(A) The state government has expanded the number of government medical colleges to improve doctor-population ratios
(B) Government medical colleges are completely prohibited from taking part in Ayushman Bharat scheme
(C) Medical colleges provide tertiary healthcare services and specialized treatments
(D) Medical colleges function as crucial referral centers for complex cases from district hospitals

69. Which of the following is a key objective of the Public-Private Partnership models implemented in the health sector of Madhya Pradesh?
(A) To improve public health service delivery using private resources
(B) To eliminate all existing government

(C) Regulating the pricing of private pharmaceutical companies
(D) Specialized medical care and quality medical education

53. The life expectancy at birth target outlined in the National Health Policy 2017 to be achieved by the year 2025 is:
(A) 65 years
(B) 67.5 years
(C) 70 years
(D) 72.5 years

54. According to the eligibility criteria of Ayushman Bharat PMJAY, the identification of beneficiary families is strictly based on:
(A) Current income tax returns filed by the family head
(B) Voluntary registration through annual payment of a premium
(C) Deprivation and occupational criteria of the SECC 2011
(D) Recommendations provided by the local Member of Parliament

55. Which statement best defines the role of a skilled birth attendant in the context of safe motherhood programmes in Madhya Pradesh?
(A) An accredited professional such as a midwife or doctor
(B) An untrained elderly woman in the village who assists in home births
(C) A traditional healer prescribing herbal remedies for pregnant women
(D) A community mobilization worker providing nutritional health advice

56. Read the following statements regarding maternal and child health in Madhya Pradesh.
I. Poshan Maah is celebrated every year to improve nutritional outcomes.
II. Institutional deliveries have decreased drastically over the last decade due to Janani Suraksha Yojana.
III. Safe motherhood initiatives ensure the presence of a skilled birth attendant during delivery.
IV. Madhya Pradesh has successfully eradicated all forms of child malnutrition.
V. The state health department utilizes ASHA workers to promote safe motherhood practices in tribal belts.
Which of the above statement(s) is/are correct?
(A) I, III and V
(B) I, II and IV
(C) II, III and V
(D) III, IV and V

57. Which of the following statements about the Pulse Polio Programme is correct?
(A) National Immunization Days for oral polio drops for children under 5
(B) Administering the oral polio vaccine to children only above 5 years
(C) Funding the program through the private corporate sector of India
(D) Discontinuing the program in 2005 due to lack of public interest

58. Janani Suraksha Yojana aims to reduce maternal and neonatal mortality by promoting which of the following?
(A) Institutional deliveries among pregnant women
(B) Home deliveries by traditional birth attendants
(C) Use of herbal medicines during pregnancy
(D) Restriction of diet to prevent high birth weight

59. Which of the following is a direct exception to the free entitlement rule under the Janani Shishu Suraksha Karyakram?
(A) Normal deliveries at public health institutions
(B) Sick infants up to one year of age accessing public health institutions
(C) Cosmetic surgical procedures requested by the mother
(D) Transportation from home to the health institution for pregnant women

60. The implementation of telemedicine initiatives in Madhya Pradesh is primarily hindered by which cause?
(A) Excessive supply of specialized doctors available in village clinics
(B) Limited internet connectivity and digital literacy in rural pockets
(C) Total ban on digital prescriptions imposed by the state government
(D) High willingness of rural patients to travel

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Which of the above statement(s) is/are correct?
(A) I, II, III and IV
(B) I, II, IV and V
(C) II, III, IV and V
(D) I, III, IV and V

78. Match the national health programmes in List I with their key focus areas in List II and select the correct option.
List I: (National Health Programme)
P. National Programme for Control of Blindness
Q. National Mental Health Programme
R. National Vector Borne Disease Control Programme
S. National Tuberculosis Elimination Programme
List II: (Focus Area)
1. Malaria and Dengue
2. DOTS strategy implementation
3. Cataract surgeries
4. Community psychosocial support
(A) P-4, Q-3, R-2, S-1
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-1, R-4, S-3
(D) P-3, Q-4, R-1, S-2

79. Tele-consultation services in Health and Wellness Centres under Ayushman Bharat aim to achieve which of the following?
(A) Replacing all physical examinations with online automated chats
(B) Specialist consultation for remote patients via health officers
(C) Selling various medical insurance packages through online portals
(D) Allowing patients to self-prescribe scheduled drugs and narcotics

80. The target to eliminate lymphatic filariasis under the National Vector Borne Disease Control Programme relies heavily on which strategy?
(A) Indoor Residual Spraying alone
(B) Mandatory hospitalization of all residents
(C) Distribution of free mosquito repellents exclusively
(D) Mass Drug Administration

81. Which of the following best describes the Nikshay Poshan Yojana under the National Tuberculosis Elimination Programme?
(A) Providing free high-end laptops for all registered TB patients
(B) Focusing entirely on the nutritional needs of pregnant women
(C) Financial support for the nutritional needs of TB patients
(D) Mandating that TB patients must work in local agricultural fields

82. Under the Rashtriya Bal Swasthya Karyakram, mobile health teams screen children at which specific locations?
(A) Anganwadi centres and government schools
(B) Airports and international railway stations
(C) Private corporate offices and businesses
(D) Agricultural market yards and warehouses

83. Read the following statements regarding the Janani Suraksha Yojana.
I. It is a safe motherhood intervention under the National Health Mission.
II. It integrates cash assistance with delivery and post-delivery care.
III. It strictly applies only to urban areas of the country.
IV. ASHA acts as an effective link between the government and poor pregnant women under this scheme.
Which of the above statement(s) is/are correct?
(A) I, II and III
(B) I, II and IV
(C) II, III and IV
(D) I, III and IV

84. The implementation of the National Mental Health Programme involves setting up District Mental Health Programmes. Which of the following is not a component of it?
(A) Early detection and treatment of mental illness
(B) Training of general duty medical officers
(C) Establishing permanent asylums
(D) Information, Education and Communication activities for awareness

85. The Pradhan Mantri Surakshit Matritva Abhiyan entails providing assured, comprehensive, and quality antenatal care to pregnant women in which trimester of their pregnancy?
(A) First trimester only
(B) Second and third trimesters

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ANSWERS

1. (D) P-4, Q-3, R-2, S-1
The Bhore Committee submitted its report in 1946, laying the foundation for India's public health system. The Mudaliar Committee followed in 1962, focusing on planning and survey. The Chadha Committee dealt with malaria in 1963, and the Kartar Singh Committee emphasized multipurpose workers in 1973. Together, these reports provided a strategic chronological roadmap for healthcare administration.

2. (B) 2025
India has committed to eliminating tuberculosis by 2025, five years ahead of the global Sustainable Development Goal target of 2030. This ambitious timeline involves intensive case finding, providing nutritional support through financial incentives, and ensuring universal access to high-quality diagnosis and treatment services. The National Tuberculosis Elimination Programme coordinates these multi-sectoral efforts to achieve a TB-free nation.

3. (B) Increase it to 2.5 percent of GDP by 2025
The National Health Policy 2017 outlines a significant roadmap for strengthening India's public healthcare system. One of its primary financial commitments is to increase public health expenditure to 2.5 percent of the Gross Domestic Product by the year 2025. This increase is intended to reduce out-of-pocket expenses and ensure equitable access to quality healthcare services across all population segments.

4. (C) Below Poverty Line families
Implemented in Madhya Pradesh, the Deen Dayal Antyodaya Upchar Yojana is a state-funded initiative designed to provide a financial safety net for marginalized citizens. It specifically targets families living Below the Poverty Line, offering free medical treatment and diagnostic facilities up to a set annual limit. This scheme aims to minimize the burden of healthcare costs on the most vulnerable.

5. (C) I and III only
Accredited Social Health Activists play a pivotal role in community health by creating awareness and mobilizing local planning. They act as bridges between the community and health facilities, facilitating access to essential services like immunization and antenatal care. However, they are not trained or authorized to perform major surgical interventions, which require highly specialized medical professionals and equipment.

6. (B) P-3, Q-2, R-1, S-4
In plain rural areas, a Sub-Health Centre serves 5,000 people, while a Primary Health Centre covers 30,000. A Community Health Centre provides referral services for 1,20,000 individuals, and the District Hospital serves the entire population of the district. These population norms ensure that health facilities are distributed systematically to provide accessible and equitable medical care across diverse regions.

7. (B) Bhore Committee
Established in 1943 and submitting its report in 1946, the Bhore Committee is recognized as the foundational framework for India's public health policy. It introduced the concept of comprehensive healthcare and emphasized the integration of preventive and curative services. The committee's recommendations led to the development of the primary health center model, which remains central to rural health delivery today.

8. (B) Rupees 5,000 in three installments
The Pradhan Mantri Matru Vandana Yojana provides a cash incentive of 5,000 rupees to eligible pregnant women and lactating mothers for their first living child. This benefit is distributed in three installments linked to early pregnancy registration, antenatal check-ups, and child birth registration with the first cycle of immunization. It aims to compensate for wage loss and promote health-seeking behavior.

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(C) Free distribution of supplementary agricultural fertilizers
(D) Free diagnostics such as urine tests and ultrasonography

95. Which statement is incorrect regarding the role and functioning of an ASHA worker?
(A) A regular government employee with a fixed salary of 50,000 rupees
(B) A permanent resident of the specific village she is assigned to serve
(C) A worker receiving performance-based incentives for promoting health schemes
(D) A facilitator in the preparation and implementation of the Village Health Plan

96. Match the specific target group in List I with the most appropriate health programme in List II and select the correct option.
List I: (Target Group)
P. Unimmunized children under 2 years
Q. Pregnant women accessing institutional delivery
R. Children aged 0-18 years for birth defects
S. Vulnerable families requiring secondary/ tertiary care
List II: (Health Programme)
1. Ayushman Bharat PMJAY
2. Mission Indradhanush
3. Janani Suraksha Yojana
4. Rashtriya Bal Swasthya Karyakram
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-1, R-2, S-3

97. Which of the following is an accurate feature of the Intensified Mission Indradhanush?
(A) Targeting districts and urban areas with low immunization coverage
(B) Permanently halting all routine immunization activities in the state
(C) Focusing solely on providing the COVID-19 vaccine to all citizens
(D) Limiting vaccination services strictly to the adult male population

98. Read the following statements regarding the structure of the health department in Madhya Pradesh.
Statement I: The Directorate of Health Services is responsible for the planning, implementation, and monitoring of health programmes at the state level.
Statement II: Medical colleges and associated hospitals are structurally managed by a separate Department of Medical Education.
Identify the correct option:
(A) Statement I is correct and Statement II is incorrect
(B) Statement I is incorrect and Statement II is correct
(C) Both Statement I and Statement II are correct
(D) Both Statement I and Statement II are incorrect

99. The Pradhan Mantri Matru Vandana Yojana provides cash maternity benefits through Direct Benefit Transfer. Who bears the financial burden of this scheme?
(A) Entirely the State Government
(B) Entirely the Central Government
(C) Funded by international non-governmental organizations
(D) Cost shared between Central and State Governments

100. In the context of Madhya Pradesh's health infrastructure, the availability of 108 Ambulance services primarily targets which aspect of health care?
(A) Providing routine home checkups for chronic diseases in rural areas
(B) Delivering monthly food rations to all local Anganwadi centres
(C) Serving as mobile pharmaceutical manufacturing units for the state
(D) Emergency medical response and patient transport to facilities

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hospitals in the state
(C) To transfer all health budgets directly to private corporate accounts
(D) To ensure that rural populations are forced to pay higher medical fees

70. The 'Sardar Vallabh Bhai Patel Free Drug Distribution Scheme' in Madhya Pradesh ensures which of the following?
(A) Distribution of free agricultural chemicals in rural areas
(B) Free distribution of narcotic drugs for pain management centers
(C) Essential medicines free of cost in government health facilities
(D) Subsidized medicines exclusively provided for state politicians

71. Which of the following best explains the concept of a 'Sub-Centre' in the rural health infrastructure of Madhya Pradesh?
(A) Peripheral and first contact point between health system and community
(B) The highest level of specialized medical care within a district
(C) A medical college outpost dedicated solely to advanced surgery
(D) An administrative office situated only in the state capital region

72. The term 'Comprehensive Primary Health Care' introduced in the National Health Policy 2017 implies extending primary care services beyond which traditional boundaries?
(A) Extending surgical and trauma care to exclusive dental care
(B) Including non-communicable diseases and palliative care
(C) Moving beyond urban areas to include international territories
(D) Utilizing government facilities to create privatized health centers

73. Choose the correct sequential selection of key strategies implemented in the National Tuberculosis Elimination Programme to reach its goals:
(A) Private sector engagement - Active case finding - Provision of free drugs - Digital notification
(B) Digital notification - Discontinuation of medication - Mandatory quarantine - Active case finding
(C) Provision of free drugs - Private sector exclusion - Active case finding - Digital notification
(D) Active case finding - Imposing treatment fees - Digital notification - Private sector engagement

74. What is a primary role of the State Institute of Health and Family Welfare (SIHFW) in Madhya Pradesh?
(A) Formulating state defense policies for national security
(B) Primary appellate court for medical negligence and legal cases
(C) Apex nodal training and research institute for health personnel
(D) Directly manufacturing vaccines for distribution in the state

75. Find the odd one out regarding the levels of the public healthcare delivery system in India.
(A) Sub-Health Centre
(B) Primary Health Centre
(C) Community Health Centre
(D) Anganwadi Training Centre

76. Identify the correct statement regarding the integration of Information Technology in the health sector of Madhya Pradesh.
(A) Total state-wide ban on the use of electronic health records
(B) Primary health centers operated entirely by artificial intelligence
(C) Health IDs generated exclusively for state government officials
(D) Telemedicine networks connecting rural centers with experts

77. Read the following statements regarding the immunization initiatives in India.
I. Pulse Polio uses Oral Polio Vaccine drops.
II. Mission Indradhanush focuses on unimmunized and partially immunized children.
III. Polio is still endemic in Madhya Pradesh.
IV. Intensified Mission Indradhanush aims to accelerate full immunization coverage.
V. Immunization services under national programmes are provided free of cost.

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9. (C) III only
The National Leprosy Eradication Programme focuses on achieving a prevalence rate of less than one case per ten thousand population. ASHA workers are integral to this mission as they help identify and refer suspected cases. Crucially, the program continues to rely on Multi-Drug Therapy as the primary and effective treatment, making any suggestion of its discontinuation due to side effects incorrect.

10. (C) It comprises sub-missions for the National Rural Health and National Urban Health Missions
The National Health Mission serves as an umbrella framework that encompasses two major sub-missions: the National Rural Health Mission and the National Urban Health Mission. This integrated approach allows for a comprehensive focus on the health needs of both rural and urban populations. It receives significant central funding and support to strengthen public health systems and improve overall health outcomes nationwide.

11. (C) 14 digits
Under the Ayushman Bharat Digital Mission, a unique 14-digit Health ID, now known as the Ayushman Bharat Health Account number, is generated for citizens. This identifier enables the digital storage and sharing of health records across various healthcare providers. It facilitates seamless access to medical history, ensuring better clinical decision-making and providing a unified digital health infrastructure for all patients.

12. (C) Accessing necessary health services without experiencing financial hardship
Universal Health Coverage is a fundamental public health concept ensuring that all individuals can access the health services they need without suffering financial distress. This includes the full spectrum of essential, quality health services, from health promotion to prevention, treatment, rehabilitation, and palliative care. The goal is to provide equitable access to care while protecting citizens from catastrophic medical expenses.

13. (A) Achieving full immunization for children and pregnant women
Mission Indradhanush was launched to strengthen and re-energize the immunization program, aiming for full coverage of children and pregnant women. It specifically targets those who have been partially vaccinated or remain unvaccinated in high-risk areas. By ensuring that every child receives life-saving vaccines against preventable diseases, the initiative strives to reduce child mortality and improve the overall public health.

14. (B) One ASHA per 1000 population
Under the National Health Mission guidelines, the standard norm for selecting an Accredited Social Health Activist in rural areas is one worker for every 1,000 population. This ratio ensures that the health activist can effectively engage with the community, provide health education, and facilitate access to services. In tribal or hilly regions, this norm may be relaxed to ensure better coverage.

15. (C) Jabalpur
The State Institute of Health and Family Welfare serves as the premier apex training and research organization for the health department in Madhya Pradesh. It is strategically headquartered in Jabalpur and focuses on enhancing the skills of medical officers and paramedical staff. The institute plays a vital role in implementing national health programs by providing high-quality technical guidance and administrative training.

16. (A) Statement I is correct and Statement II is incorrect
The National Health Policy of 1983 was indeed India's first such policy, aligning with the Alma-Ata Declaration to achieve universal health coverage by 2000. It emphasized primary healthcare and the expansion of rural health infrastructure. Therefore, the claim that it shifted focus entirely toward private tertiary care hospitals is factually incorrect, as its primary goal was strengthening the public sector.

17. (A) Free heart surgery for children with congenital diseases
The Mukhyamantri Bal Hridaya Upchar Yojana is a specialized health initiative in Madhya Pradesh

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(C) Post-natal period exclusively
(D) Pre-conception stage

86. What is the fundamental difference between PMJAY and Mukhyamantri Swasthya Bima Yojana in Madhya Pradesh?
(A) PMJAY covers outpatient costs while the latter covers inpatient costs
(B) PMJAY is a central scheme while the latter is a state initiative
(C) PMJAY is only for government employees while the latter is for the public
(D) There is no difference as they are exact synonyms for each other

87. Which of the following is a fundamental cause for the implementation of the Janani Shishu Suraksha Karyakram?
(A) Excess availability of pediatricians in all rural health clinics
(B) High out-of-pocket expenditure preventing institutional delivery
(C) Complete elimination of maternal mortality rates in the country
(D) Rising popularity of traditional home births among urban elites

88. How does the National Urban Health Mission address the challenge of reaching marginalized urban populations?
(A) By restricting health access to those with permanent urban property
(B) By deploying Urban Social Health Activists (USHAs)
(C) By moving slum dwellers back to rural areas for treatment
(D) By charging a premium health tax in urban wards

89. Read the following statements regarding the structure of health care facilities.
Statement I: A Community Health Centre is designed to provide referral healthcare for cases from Primary Health Centres.
Statement II: A typical Community Health Centre provides specialist services such as obstetrics, pediatrics, and surgery.
Identify the correct option:
(A) Statement I is correct and Statement II is incorrect
(B) Statement I is incorrect and Statement II is correct
(C) Both Statement I and Statement II are correct
(D) Both Statement I and Statement II are incorrect

90. Which administrative officer oversees the overall functioning of all health centres and district hospitals within a district in Madhya Pradesh?
(A) Chief Medical and Health Officer
(B) District Education Officer
(C) Block Development Officer
(D) Sub-Divisional Officer Police

91. The cash assistance provided to a mother delivering in a public health institution in rural areas of a Low Performing State like Madhya Pradesh under Janani Suraksha Yojana is typically:
(A) Rupees 1000
(B) Rupees 1400
(C) Rupees 2000
(D) Rupees 5000

92. If a district in Madhya Pradesh records an unusually high incidence of malaria, which national programme's guidelines and resources should the Chief Medical and Health Officer (CMHO) immediately invoke?
(A) National Leprosy Eradication Programme
(B) National Mental Health Programme
(C) National Vector Borne Disease Control Programme
(D) National Programme for Control of Blindness

93. The primary focus of the National Health Policy 1983 was fundamentally derived from the goals set by which international declaration?
(A) Geneva Convention
(B) Kyoto Protocol
(C) Paris Agreement
(D) Alma-Ata Declaration

94. Identify the exception among the following services which are supposedly free at public health centres under the Janani Shishu Suraksha Karyakram.
(A) Free diet during stay in the health institution
(B) Free provision of blood

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mandatory monitoring period directly led to the official certification by the World Health Organization.

26. (D) It set a definitive target to privatize all rural health care infrastructure by 2010
The National Health Policy 2002 aimed to achieve several public health goals, including the eradication of polio and yaws and the integration of AYUSH systems. It emphasized decentralization and strengthening public health systems to improve service delivery. The policy never advocated for the complete privatization of rural health infrastructure; instead, it sought to enhance public sector performance and universal coverage.

27. (A) Chief Medical and Health Officer
In the administrative hierarchy of Madhya Pradesh, the Chief Medical and Health Officer serves as the primary executive head of health services at the district level. This official is responsible for the overall management, supervision, and monitoring of all public health facilities, including district hospitals and primary centers. They ensure the effective implementation of various state and national health programs locally.

28. (B) 2005
The National Rural Health Mission was officially launched in April 2005 to address the healthcare needs of the rural population. It introduced significant reforms, including the deployment of ASHA workers and the strengthening of rural health infrastructure through flexible funding. This mission served as a precursor to the broader National Health Mission, focusing on maternal, child, and communicable disease control.

29. (C) Measles
The National Vector Borne Disease Control Programme targets six specific diseases: malaria, dengue, Japanese encephalitis, kala-azar, chikungunya, and lymphatic filariasis. These diseases are primarily transmitted through vectors like mosquitoes and sandflies. Measles is a viral disease transmitted through respiratory droplets and is addressed under the Universal Immunization Programme, not as a vector-borne illness within this specific national control framework.

30. (D) Pradhan Mantri Matru Vandana Yojana - Senior citizens above 60 years
The Pradhan Mantri Matru Vandana Yojana is specifically a maternity benefit program for pregnant women and lactating mothers for their first living child. It is not designed for senior citizens. In contrast, Janani Suraksha Yojana targets pregnant women, while the Rashtriya Bal Swasthya Karyakram and Mission Indradhanush focus on children and maternal health through screening and immunization services, respectively.

31. (C) Public Private Partnership
Madhya Pradesh utilizes the Public Private Partnership model to manage advanced diagnostic services like CT scans and MRI facilities in district hospitals. This approach allows the state to leverage private sector expertise and equipment while ensuring services remain accessible to patients. It bridges the gap in high-end medical infrastructure within public hospitals, ensuring that advanced diagnostics are available locally for citizens.

32. (C) Both Statement I and Statement II are correct
According to the Seventh Schedule of the Indian Constitution, public health, sanitation, hospitals, and dispensaries are subjects listed under the State List. This means state governments have the primary responsibility for health service delivery. Meanwhile, population control and family planning are placed in the Concurrent List, allowing both the Central and State governments to legislate and implement programs together.

33. (B) 9th
The Pradhan Mantri Surakshit Matritva Abhiyan ensures that all pregnant women receive a minimum package of specialized antenatal care services on the 9th of every month. This initiative provides free check-ups by specialists and medical officers in public health facilities. It aims to identify high-risk pregnancies early and ensure appropriate management, thereby contributing significantly to the reduction of maternal mortality.

34. (D) Sub-Health Centre
The Sub-Health Centre is designed as the peripheral and most basic unit of the public health system in rural India. It serves as the

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establishing large, isolated, permanent asylums for those with mental illnesses.

85. (B) Second and third trimesters
The Pradhan Mantri Surakshit Matritva Abhiyan focuses on providing specialized antenatal care to pregnant women who are in their second or third trimesters. During these stages, the risk of developing complications like hypertension or gestational diabetes increases. By providing expert check-ups on a designated day, the initiative ensures that these high-risk conditions are detected and managed promptly to ensure safe pregnancy and delivery.

86. (B) PMJAY is a central scheme while the latter is a state initiative
The Ayushman Bharat Pradhan Mantri Jan Arogya Yojana is a centrally sponsored national scheme that provides health cover to vulnerable families across India. In contrast, the Mukhyamantri Swasthya Bima Yojana is an initiative launched specifically by the state government of Madhya Pradesh to provide insurance benefits to its residents. While both aim to provide financial protection for health, they differ in their origin and administrative jurisdiction.

87. (B) High out-of-pocket expenditure preventing institutional delivery
The Janani Shishu Suraksha Karyakram was implemented primarily to address the barrier of high out-of-pocket expenses that often discouraged families from seeking institutional care. By making all services free, including drugs, diagnostics, and diet, the scheme ensures that no pregnant woman or sick infant is denied care due to financial constraints. This elimination of costs is crucial for promoting safe, hospital-based births and pediatric care.

88. (B) By deploying Urban Social Health Activists (USHAs)
To reach marginalized populations in cities, the National Urban Health Mission utilizes Urban Social Health Activists. These workers are trained to engage with slum dwellers and other vulnerable urban groups, providing them with health education and linking them to urban primary health centers. This community-based approach ensures that the specific health needs of the urban poor are addressed despite the complexities of city environments.

89. (C) Both Statement I and Statement II are correct
A Community Health Centre serves as a critical secondary level of healthcare, providing specialized referral services for cases identified at Primary Health Centres. It is equipped with specialists in surgery, pediatrics, and obstetrics to handle more complex medical situations. This structural arrangement ensures that rural populations have access to specialized clinical care without always needing to travel to large district or city hospitals.

90. (A) Chief Medical and Health Officer
In the administrative hierarchy of Madhya Pradesh, the Chief Medical and Health Officer serves as the primary executive head of health services at the district level. This official is responsible for the overall management, supervision, and monitoring of all public health facilities, including district hospitals and primary centers. They ensure the effective implementation of various state and national health programs locally.

91. (B) Rupees 1400
Under the Janani Suraksha Yojana, a mother residing in a rural area of a Low Performing State like Madhya Pradesh receives a cash incentive of 1,400 rupees for an institutional delivery. This financial assistance is designed to encourage women to give birth in medical facilities and to help cover costs associated with the delivery. It plays a significant role in increasing institutional birth rates in these regions.

92. (C) National Vector Borne Disease Control Programme
When a district experiences a high incidence of malaria, the National Vector Borne Disease Control Programme provides the necessary strategic framework and resources for response. This includes guidelines for diagnosis, treatment, and vector control measures like indoor spraying or distributing insecticide-treated nets. The CMHO relies on this specialized program to manage outbreaks of mosquito-borne diseases effectively and to coordinate local prevention efforts.

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centers in a timely manner. These physical barriers are primary factors contributing to the persistence of healthcare disparities in these regions.

43. (B) P-2, Q-4, R-1, S-3
In Madhya Pradesh, the Bal Hridaya Upchar Yojana provides free heart surgery for children, while the Deen Dayal Antyodaya Upchar Yojana offers treatment to BPL families within financial limits. The Mukhyamantri Swasthya Bima Yojana provides health insurance coverage, and the Sardar Vallabh Bhai Patel scheme ensures free drug distribution. These programs collectively represent a multifaceted approach to improving state health outcomes.

44. (A) 1, 4, 2, 3
The National Rural Health Mission was launched in 2005 to improve rural healthcare infrastructure. Mission Indradhanush followed in 2014 to boost immunization coverage. The Pradhan Mantri Matru Vandana Yojana was introduced in 2017 to provide maternity benefits. Finally, the Ayushman Bharat Digital Mission was established in 2021. This sequence reflects the progressive expansion of various national health initiatives in India.

45. (A) Both A and R are true and R is the correct explanation of A.
Health indicators like infant and maternal mortality are often poorer in tribal districts compared to state averages. This disparity is primarily due to several structural and social challenges, including tough geographical terrain, a shortage of specialized medical staff in remote areas, and lower levels of health awareness. These factors combine to create significant barriers to accessing quality healthcare services effectively.

46. (B) Providing free sunglasses to the general public
The National Programme for Control of Blindness focuses on reducing avoidable blindness through systematic interventions. Key components include performing cataract surgeries, providing spectacles for refractive errors, and strengthening eye care infrastructure. While it is a centrally sponsored scheme aimed at improving vision, the provision of free sunglasses to the general public is not a part of its clinical or public health mandate.

47. (B) Conditional cash transfers and institutional deliveries
The Janani Suraksha Yojana utilizes conditional cash transfers to incentivize pregnant women to give birth in medical institutions rather than at home. By providing financial assistance linked to institutional delivery, the scheme aims to ensure that births occur in safe environments with skilled attendance. This strategy has been a primary driver in reducing maternal and neonatal mortality across various states in India.

48. (B) Sub-Centre - Primary Health Centre - Community Health Centre - District Hospital
The referral chain in India's rural health system begins at the Sub-Centre, which is the most basic contact point. Patients needing more care are referred to the Primary Health Centre, and then to the Community Health Centre for specialist services. The District Hospital represents the highest level of care within the district structure, providing advanced secondary and some tertiary services.

49. (A) Revised National Tuberculosis Control Programme
RNTCP stands for the Revised National Tuberculosis Control Programme, which was the previous name of India's national initiative against tuberculosis. It focused on the DOTS strategy for standardized diagnosis and treatment. In 2020, it was renamed the National Tuberculosis Elimination Programme to reflect the renewed goal of ending the TB epidemic in the country by the year 2025.

50. (C) Awareness about maternal, infant, and young child nutrition
Poshan Maah is an annual campaign held in September to focus on improving nutritional outcomes across the country. It emphasizes the importance of maternal, infant, and young child nutrition to combat malnutrition and stunting. Through community-based activities and awareness drives, the program aims to educate families about healthy dietary practices and the utilization of government nutrition services for better health.

51. (B) Seven
At its launch, Mission Indradhanush was named after the seven colors of the rainbow, representing

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primary point of contact between the community and the healthcare system. Manned by auxiliary nurse midwives and multipurpose workers, it provides essential maternal, child, and basic curative health services directly to the village population at their doorstep.

35. (A) Cholera
The National Vector Borne Disease Control Programme specifically addresses illnesses transmitted by insects, such as malaria, chikungunya, and kala-azar. These diseases require vector control strategies like mosquito management. Cholera is a water-borne disease caused by ingesting contaminated food or water. It is managed through water sanitation and hygiene interventions, placing it outside the scope of vector-borne disease control programs.

36. (A) Urban poor population residing in listed and unlisted slums
The National Urban Health Mission specifically focuses on the health needs of the urban poor, including slum dwellers and other vulnerable groups like homeless people and rickshaw pullers. By establishing urban primary health centers and deploying urban ASHA workers, it aims to provide quality primary care within the city. The mission addresses the unique challenges of healthcare accessibility in dense urban environments.

37. (A) Integrating mental health with general health care at the district level
The District Mental Health Programme, under the National Mental Health Programme, focuses on decentralizing psychiatric services by integrating them into the general healthcare system. It emphasizes early detection, treatment, and community-based rehabilitation at the district level. By training general medical officers and health workers in mental health, the program ensures that these essential services are accessible to the local population regularly.

38. (D) Pradhan Mantri Jan Arogya Yojana
Within the Ayushman Bharat framework, the Pradhan Mantri Jan Arogya Yojana specifically provides financial coverage for secondary and tertiary care hospitalization. While Health and Wellness Centres handle primary care and wellness, PMJAY ensures that vulnerable families can access specialized surgeries and medical treatments in hospitals without facing financial ruin. This two-pronged approach addresses both basic healthcare needs and expensive hospital-based interventions.

39. (D) Upgrading Sub-Centres into Health and Wellness Centres
The National Health Policy 2017 advocates for a paradigm shift from sick care to preventive wellness. This is being implemented by transforming existing Sub-Centres and Primary Health Centres into Health and Wellness Centres. These upgraded facilities provide a wider range of services, including screening for chronic diseases and promoting healthy lifestyles, ensuring that primary care is comprehensive rather than just curative.

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40. (D) Leprosy
The National Leprosy Eradication Programme defines elimination as reducing the prevalence rate to less than one case per ten thousand population. This target is a critical benchmark for public health success in controlling the disease. Achieving this level indicates that the transmission has been significantly interrupted, allowing the health system to transition from intensive eradication efforts to sustained surveillance and management.

41. (B) Mandatory sterilization of the husband
Financial assistance under the Pradhan Mantri Matru Vandana Yojana is linked to specific health and nutrition goals for the mother and child. These include early registration of pregnancy, completion of antenatal check-ups, and registration of the child's birth along with the first vaccination cycle. Sterilization of the husband is not a requirement for receiving these maternity benefits under current program guidelines.

42. (C) Geographical isolation and lack of adequate transport connectivity
Tribal areas in Madhya Pradesh often face significant health infrastructure gaps due to their remote locations and difficult terrain. Geographical isolation makes it challenging to establish facilities and deploy medical personnel consistently. Additionally, poor transport connectivity hinders patients from reaching

60. (B) Limited internet connectivity and digital literacy in rural pockets
Telemedicine initiatives in Madhya Pradesh face significant challenges due to the digital divide in rural areas. Limited internet connectivity and lower levels of digital literacy among both patients and local health workers can hinder the smooth operation of virtual consultations. Overcoming these technical and educational barriers is essential for the successful expansion of e-health services across the state's remote pockets.

61. (C) Ayushman Bharat Digital Mission
The ABHA number is a unique health identity generated under the Ayushman Bharat Digital Mission. It serves as a digital gateway for citizens to access and share their health records electronically with their consent. This initiative aims to create a seamless digital healthcare ecosystem where patients can manage their medical history and access various health services across different providers efficiently.

62. (A) Direct payment made by individuals to healthcare providers
Out-of-pocket expenditure refers to the direct payments individuals make to healthcare providers at the time of service, which are not covered by insurance or government schemes. High levels of such spending can lead to financial hardship and poverty for many families. National health policies often aim to reduce this burden by increasing public health funding and providing free essential services.

63. (A) Correction of deformities caused by the disease
Reconstructive surgeries are provided under the National Leprosy Eradication Programme to help patients who have developed physical deformities due to the disease. These surgeries aim to restore the function of hands, feet, or eyes, thereby improving the patient's quality of life and facilitating their social reintegration. This clinical intervention is a key part of the comprehensive care offered to leprosy-affected individuals.

64. (C) Classification of state performance and rural/urban areas
Cash incentives under the Janani Suraksha Yojana are categorized based on whether a state is classified as Low Performing or High Performing. Furthermore, the incentive amounts vary between rural and urban areas to account for differing needs and accessibility challenges. This differentiated approach ensures that the program provides more significant support to regions where institutional delivery rates have historically been much lower.

65. (A) Rashtriya Bal Swasthya Karyakram
While the Pradhan Mantri Surakshit Matritva Abhiyan, Janani Shishu Suraksha Karyakram, and Janani Suraksha Yojana all specifically target maternal health and safe delivery, the Rashtriya Bal Swasthya Karyakram is a child health initiative. RBSK focuses on screening children for defects and deficiencies from birth until eighteen years of age. Therefore, it serves a different primary demographic compared to the maternal-focused schemes.

66. (A) 1, 2, 4, 3
The Alma-Ata Declaration of 1978 established the global goal of primary healthcare. Following this, India formulated its first National Health Policy in 1983. The second policy was introduced in 2002 to address emerging health challenges. Finally, the 2017 National Health Policy was launched, incorporating universal health coverage goals and addressing modern healthcare needs, representing the correct historical sequence of these landmarks.

67. (C) I and III only
The National Health Mission seeks to provide equitable and affordable health care to all citizens, with a strong focus on maternal and child health interventions. Contrary to excluding communicable diseases, the mission actually integrates various control programs for diseases like tuberculosis and malaria into its framework. This comprehensive approach ensures that multiple public health challenges are addressed through a unified administrative structure.

68. (B) Government medical colleges are completely prohibited from taking part in Ayushman Bharat scheme
Medical colleges in Madhya Pradesh are vital tertiary care centers that handle complex cases referred from district hospitals. They play a double role by providing specialized medical treatment

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CHAPTER 08

Infectious Diseases, Prevention and Health Indicators

1. Tuberculosis is primarily transmitted through which of the following routes?
(A) Ingestion of water contaminated by bacterial toxins
(B) Bite of an infected female Anopheles mosquito vector
(C) Direct skin-to-skin contact with infectious lesions
(D) Inhalation of droplet nuclei containing bacteria

2. Historically, which geographic region of Madhya Pradesh is considered most vulnerable to Japanese Encephalitis due to its proximity to endemic zones in a neighboring state?
(A) Semi-arid Malwa region in the western part
(B) Nimar region located in the southwestern belt
(C) Eastern districts bordering Uttar Pradesh state
(D) Southern districts bordering Maharashtra state

3. Which of the following is an example of a disease that is infectious but typically NOT communicable from person to person?
(A) Influenza
(B) Tuberculosis
(C) Tetanus
(D) Measles

4. Which of the following represents the correct sequence of the general pathogenesis and clinical progression of an infectious disease like Leprosy?
(A) Exposure, Incubation period, Prodromal stage, Clinical illness, Convalescence
(B) Exposure, Prodromal stage, Incubation period, Clinical illness, Convalescence
(C) Incubation period, Exposure, Clinical illness, Prodromal stage, Convalescence
(D) Exposure, Clinical illness, Prodromal stage, Incubation period, Convalescence

5. Outbreaks of waterborne diseases like Cholera and Typhoid frequently occur during which season in Madhya Pradesh?
(A) Dry winter months with low humidity
(B) Monsoon and immediate post-monsoon
(C) Intense pre-monsoon summer periods
(D) Pleasant spring and flowering seasons

6. Which national programme specifically targets the prevention and control of HIV/AIDS in India?
(A) National Vector Borne Disease Control Programme
(B) National AIDS Control Programme (NACP)
(C) Revised National Tuberculosis Control Programme
(D) Integrated Disease Surveillance Programme

7. Which of the following best defines an infectious disease?
(A) A condition resulting from genetic abnormalities present at birth
(B) A disease caused by pathogens spread directly or indirectly
(C) A disorder resulting from lifestyle choices and pollution
(D) A condition characterized by the gradual breakdown of cells

8. Why do tribal-dominated districts in Madhya Pradesh like Jhabua, Alirajpur, and Mandla exhibit a higher prevalence of malaria?
(A) Low rainfall preventing natural flushing of water bodies
(B) Specific terrain and practices facilitating transmission
(C) Genetic predisposition that attracts Anopheles mosquitoes

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hospitals. This allows patients in remote areas to receive expert consultations virtually. Such initiatives bridge geographical gaps and improve access to specialized care, demonstrating the state's commitment to using modern digital tools for enhancing public health service delivery.

77. (B) I, II, IV and V
India's immunization initiatives involve using oral drops for polio and targeting unimmunized children through Mission Indradhanush. These services are provided free of cost to ensure universal access. Intensified versions of these missions aim to accelerate coverage in low-performing areas. Since India is certified polio-free, the disease is no longer endemic in Madhya Pradesh, though surveillance and routine immunization continue to prevent recurrence.

78. (D) P-3, Q-4, R-1, S-2
The National Programme for Control of Blindness focuses on cataract surgeries, while the National Mental Health Programme provides community psychosocial support. Vector-borne disease control addresses illnesses like malaria and dengue, and the tuberculosis program implements the DOTS strategy. These specialized programs ensure that specific public health challenges are managed with targeted resources and expert guidelines across all levels of the health system.

79. (B) Specialist consultation for remote patients via health officers
Tele-consultation services at Health and Wellness Centres allow mid-level health providers to connect patients with specialist doctors located at higher-level facilities. This system enables patients in rural areas to receive expert medical advice without having to travel to district or city hospitals. It significantly improves the quality of primary care by providing access to specialized knowledge at the community level through digital platforms.

80. (D) Mass Drug Administration
The strategy to eliminate lymphatic filariasis involves Mass Drug Administration, where entire communities in endemic areas are provided with preventive medication once a year. This approach aims to interrupt the transmission cycle of the parasite by reducing the microfilaria levels in the population. When combined with vector control, this large-scale medication drive is the primary method used to achieve the elimination of this debilitating disease.

81. (C) Financial support for the nutritional needs of TB patients
The Nikshay Poshan Yojana is a specialized scheme under the National Tuberculosis Elimination Programme that provides financial assistance to all notified TB patients. This support, typically five hundred rupees per month, is intended to help patients meet their nutritional requirements during the course of their treatment. Proper nutrition is critical for the recovery of TB patients and enhances the effectiveness of their medical treatment.

82. (A) Anganwadi centres and government schools
Under the Rashtriya Bal Swasthya Karyakram, mobile health teams systematically visit Anganwadi centers and government schools to screen children for various health conditions. This proactive approach ensures that birth defects, deficiencies, and developmental delays are identified early in childhood and adolescence. By reaching children where they study and play, the program facilitates timely medical intervention and management of identified health issues.

83. (B) I, II and IV
Janani Suraksha Yojana is a critical safe motherhood intervention that provides cash assistance linked to institutional delivery and postnatal care. It operates across both rural and urban areas, although incentive structures may differ. ASHA workers serve as vital links, identifying eligible pregnant women and helping them navigate the health system. The scheme is a central part of the mission to reduce maternal and neonatal mortality nationwide.

84. (C) Establishing permanent asylums
The District Mental Health Programme focuses on modern, community-based psychiatric care, including early detection, treatment, and awareness through information and education. It also involves training general medical officers to handle common mental health issues. The program emphasizes integrating mental health into general hospitals and outpatient care, moving away from the outdated practice of

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and educating future health professionals. Importantly, government medical colleges actively participate in the Ayushman Bharat scheme, offering cashless secondary and tertiary treatments to eligible beneficiaries, making the claim of their prohibition entirely false.

69. (A) To improve public health service delivery using private resources
Public-Private Partnership models in the health sector of Madhya Pradesh aim to enhance the quality and reach of services by combining public oversight with private sector efficiency. These models are often used for diagnostic services, ambulance operations, and managing specialized clinics. The goal is to optimize health service delivery and fill infrastructure gaps without replacing the essential role of the government in public healthcare.

70. (C) Essential medicines free of cost in government health facilities
The Sardar Vallabh Bhai Patel Free Drug Distribution Scheme ensures that a wide range of essential medicines is available free of cost to all patients visiting government health facilities in Madhya Pradesh. This initiative is designed to reduce out-of-pocket expenditure for medicines, which often constitutes a large portion of healthcare costs. It ensures that patients receive necessary pharmaceutical treatment regardless of their financial status.

71. (A) Peripheral and first contact point between health system and community
A Sub-Centre serves as the most peripheral unit of the health system in rural Madhya Pradesh, acting as the first point of contact for the community. It is responsible for delivering basic primary care services, including maternal and child health, immunization, and health education. These centers are essential for ensuring that healthcare reaches the doorstep of the rural population in remote areas.

72. (B) Including non-communicable diseases and palliative care
Comprehensive Primary Health Care, as defined in the National Health Policy 2017, moves beyond traditional maternal and child health services. It integrates the management of non-communicable diseases, mental health, and palliative care into the primary healthcare level. This approach ensures that the health system addresses the evolving disease burden of the population by providing a holistic range of services at the local level.

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73. (A) Private sector engagement - Active case finding - Provision of free drugs - Digital notification
The National Tuberculosis Elimination Programme utilizes multiple strategies to end the TB epidemic, including active case finding to identify hidden cases and engaging the private sector for notification. It ensures the provision of free diagnostic and drug services to all patients. Additionally, digital notification through portals like Nikshay helps in monitoring treatment adherence and managing patient data effectively across the entire country.

74. (C) Apex nodal training and research institute for health personnel
The State Institute of Health and Family Welfare in Madhya Pradesh functions as the apex nodal center for the training and professional development of health personnel. It conducts research and evaluations to improve the implementation of health programs. By building the capacity of medical and paramedical staff, the institute ensures that the state's healthcare workforce is equipped with the necessary skills and knowledge.

75. (D) Anganwadi Training Centre
The public healthcare delivery system in India is structured into primary, secondary, and tertiary levels, which include Sub-Health Centres, Primary Health Centres, and Community Health Centres. These facilities provide direct medical care to the population. While Anganwadi Training Centres are important for the skill development of child nutrition workers, they are educational and administrative facilities rather than clinical service delivery points within the medical system.

76. (D) Telemedicine networks connecting rural centers with experts
Madhya Pradesh has integrated information technology into its health sector by establishing telemedicine networks that connect rural primary health centers with specialists in larger

93. (D) Alma-Ata Declaration
India's first National Health Policy of 1983 was deeply influenced by the 1978 Alma-Ata Declaration, which advocated for "Health for All." This international commitment emphasized the importance of primary healthcare as the key to achieving universal health goals. Consequently, the 1983 policy focused on expanding rural health infrastructure and integrating preventive services to provide basic healthcare to the entire population.

94. (C) Free distribution of supplementary agricultural fertilizers
The Janani Shishu Suraksha Karyakram focuses on providing free clinical and support services to pregnant women and sick infants in public health institutions. This includes free drugs, blood, diagnostics, and nutritional diet during their hospital stay. Agricultural fertilizers are unrelated to medical care and maternal health, falling instead under agricultural development programs, and are therefore not included in the entitlements provided by health facilities.

95. (A) A regular government employee with a fixed salary of 50,000 rupees
An ASHA worker is a community health volunteer rather than a regular government employee with a high fixed salary. She must be a resident of the village she serves and receives performance-based incentives for tasks like facilitating immunizations and institutional deliveries. ASHAs are essential for mobilizing the community and helping prepare local health plans, acting as a crucial bridge to the health system.

96. (B) P-2, Q-3, R-4, S-1
Mission Indradhanush focuses on unimmunized children, while Janani Suraksha Yojana targets pregnant women for institutional delivery. The Rashtriya Bal Swasthya Karyakram screens children for birth defects, and Ayushman Bharat PMJAY provides health cover for families needing hospital care. These programs are specifically tailored to meet the distinct health requirements of different demographic groups, ensuring that comprehensive care is available across various life stages.

97. (A) Targeting districts and urban areas with low immunization coverage
Intensified Mission Indradhanush is a specialized drive designed to rapidly increase immunization rates in specific districts and urban pockets where coverage has remained low. It focuses on reaching the most vulnerable children and pregnant women who missed routine vaccinations. By using a more concentrated approach, the initiative seeks to achieve full immunization coverage quickly in high-risk areas identified through systematic health surveys.

98. (C) Both Statement I and Statement II are correct
The Directorate of Health Services in Madhya Pradesh oversees the implementation and monitoring of various public health programs across the state. Meanwhile, medical colleges and their tertiary care hospitals are managed under the separate Department of Medical Education. This structural division allows for specialized focus on both general public health delivery and the advanced needs of medical training and high-level clinical services.

99. (D) Cost shared between Central and State Governments
The Pradhan Mantri Matru Vandana Yojana is a centrally sponsored scheme where the financial burden is shared between the Central and State governments. For most states, the funding ratio is sixty percent from the Center and forty percent from the State. This cooperative financial model ensures that maternity benefits can be delivered across the country through the administrative machinery of the respective state governments.

100. (D) Emergency medical response and patient transport to facilities
The 108 Ambulance service is a vital component of the emergency medical response system in Madhya Pradesh. It provides 24/7 free transportation and pre-hospital care to patients requiring urgent medical attention. By ensuring timely transport to health facilities, the service plays a critical role in reducing mortality rates during accidents, maternal emergencies, and other life-threatening medical conditions in the state.

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protection against seven vaccine-preventable diseases. These included diphtheria, whooping cough, tetanus, polio, tuberculosis, measles, and hepatitis B. Over time, the scope of the program has expanded to include additional vaccines, but the original conceptual framework was based on these seven primary immunizations for children.

52. (D) Specialized medical care and quality medical education
The establishment of AIIMS Bhopal is significant as it provides high-quality, specialized medical care and advanced clinical facilities to the people of Madhya Pradesh. As an institution of national importance, it also serves as a center for excellence in medical education and research. This helps in training the next generation of doctors while offering tertiary-level treatments previously unavailable locally.

53. (C) 70 years
The National Health Policy 2017 set several health outcome targets to be achieved by 2025, including increasing life expectancy at birth from 67.5 to 70 years. This target reflects the broader objective of improving general health conditions, reducing mortality rates, and enhancing the overall quality of life for the population through better access to healthcare and improved living standards.

54. (C) Deprivation and occupational criteria of the SECC 2011
Beneficiaries for the Ayushman Bharat PMJAY are identified based on the Socio-Economic Caste Census 2011 data. The selection is strictly governed by specific deprivation criteria for rural families and defined occupational categories for urban households. This objective method ensures that the scheme targets the poorest and most vulnerable sections of society without requiring a separate registration process or payment.

55. (A) An accredited professional such as a midwife or doctor
A skilled birth attendant is defined as a healthcare professional, such as a doctor, nurse, or midwife, who has been specially trained to manage normal deliveries. These professionals are also equipped to identify and refer complications during childbirth. Ensuring the presence of a skilled attendant is a core strategy in maternal health programs to reduce mortality and ensure safe outcomes.

56. (A) I, III and V
Maternal and child health in Madhya Pradesh is supported by annual nutrition awareness campaigns and safe motherhood initiatives that utilize skilled attendants. ASHA workers play a critical role in promoting these practices, especially in tribal areas. While institutional deliveries have actually increased due to government incentives, challenges regarding child malnutrition persist, and it has not yet been completely eradicated.

57. (A) National Immunization Days for oral polio drops for children under 5
The Pulse Polio Programme is characterized by National Immunization Days, where oral polio vaccine drops are administered to all children under five years of age. This mass immunization strategy is designed to boost immunity across the population and break the transmission of the poliovirus. Continuous monitoring and repeated cycles of these days were essential in making India a polio-free nation.

58. (A) Institutional deliveries among pregnant women
Janani Suraksha Yojana is a safe motherhood intervention that aims to reduce maternal and neonatal mortality by promoting institutional deliveries. It provides cash incentives to pregnant women who choose to give birth in public health facilities or accredited private hospitals. This strategy ensures that women receive professional medical care during delivery, which is crucial for preventing complications and ensuring maternal health.

59. (C) Cosmetic surgical procedures requested by the mother
The Janani Shishu Suraksha Karyakram guarantees free medical care for pregnant women and sick infants, including drugs, diagnostics, and transport. These entitlements are strictly for essential health services related to delivery and infant care in public institutions. Cosmetic surgical procedures are not medically necessary for safe motherhood or infant survival and are therefore excluded from the free benefits provided under this scheme.

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(D) Complete lack of Primary Health Centres in these districts

9. What is the primary cause of the increasing urban prevalence of Dengue in Madhya Pradesh cities?
(A) High levels of industrial air pollution in cities
(B) Poor waste management and water storage practices
(C) Increased consumption of street food in urban centers
(D) Migration of infected wildlife into major urban parks

10. Identify the incorrect pair regarding airborne diseases and their causative agents.
(A) Tuberculosis - Bacterium
(B) Measles - Virus
(C) Chickenpox - Protozoan
(D) Influenza - Virus

11. Match the types of Hepatitis in List I with their key characteristics in List II:
List I: (Type of Hepatitis)
P. Hepatitis A
Q. Hepatitis B
R. Hepatitis C
S. Hepatitis E
List II: (Key Characteristic)
1. Waterborne, particularly dangerous for pregnant women
2. Primarily blood-borne, highest risk of becoming chronic
3. Transmitted through blood/body fluids, vaccine-preventable
4. Fecal-oral transmission, highly prevalent childhood infection
(A) P-4, Q-3, R-2, S-1
(B) P-1, Q-2, R-3, S-4
(C) P-4, Q-2, R-3, S-1
(D) P-3, Q-4, R-1, S-2

12. Which of the following statements correctly identifies the mode of transmission for droplet infections?
(A) Pathogens suspended in air for long periods over distances
(B) Pathogens transmitted through ingestion of food and water
(C) Large respiratory droplets falling quickly within a short range
(D) Pathogens requiring intermediate arthropod vectors for hosts

13. Which specific intervention is heavily utilized to control malaria in high-endemic tribal villages in Madhya Pradesh?
(A) Distribution of LLINs and Indoor Residual Spraying
(B) Mass administration of malaria vaccines to all adults
(C) Draining of all natural rivers during the monsoon
(D) Culling of all livestock acting as intermediate hosts

14. Which of the following factors is most directly responsible for the spike in vector-borne diseases following the monsoon season?
(A) Decreased human immunity due to cold weather conditions
(B) Increased consumption of contaminated groundwater sources
(C) Stagnant water bodies acting as mosquito breeding sites
(D) Higher concentration of airborne pathogens due to humidity

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15. In the epidemiology of HIV/AIDS, what does the term “window period” refer to?
(A) Time of day when the virus is most likely to spread
(B) Final stage of AIDS involving opportunistic infections
(C) Duration for which the virus survives outside the body
(D) Period before HIV antibodies become detectable by tests

16. How does a communicable disease fundamentally differ from a non-communicable disease?
(A) They are transmissible from an infected source to a host
(B) They affect only human populations while sparing animals
(C) They spread via biological vectors rather than air particles
(D) They cannot be prevented through standard vaccination series

of women of childbearing age.
(C) It is considered "crude" because it includes all ages and both sexes in the denominator, many of whom cannot give birth.
(D) It is heavily influenced by the age and sex structure of the population.

69. Despite improvements in many health indicators, which specific nutritional indicator for children and women showed a concerning worsening trend in Madhya Pradesh from NFHS-4 to NFHS-5?
(A) Prevalence of Anemia
(B) Severe obesity
(C) Iodine deficiency
(D) Vitamin C deficiency

70. Which of the following best defines "Life Expectancy at Birth"?
(A) Maximum lifespan recorded for a human being in a region
(B) Average age at which people die from chronic diseases
(C) Average years a newborn is expected to live currently
(D) The probability of a child surviving past the age of five

71. Match the National Health Programmes in List I with their target diseases or conditions in List II:
List I: (National Health Programme)
P. NLEP
Q. NACP
R. NVBDCP
S. NTEP
List II: (Target Disease/Condition)
1. Malaria and Dengue
2. Tuberculosis
3. Leprosy
4. HIV/AIDS
(A) P-3, Q-4, R-1, S-2
(B) P-3, Q-1, R-4, S-2
(C) P-4, Q-3, R-2, S-1
(D) P-2, Q-4, R-1, S-3

72. Consider the following statements regarding the Maternal Mortality Ratio (MMR) in Madhya Pradesh:
I. The MMR represents the number of maternal deaths during pregnancy or within 42 days of termination of pregnancy.
II. Madhya Pradesh's MMR is currently lower than the national average of India.
III. The Janani Suraksha Yojana (JSY) is a key intervention aimed at reducing MMR by promoting institutional deliveries.
Which of the combinations is correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

73. In the context of disease burden indicators, how is DALY (Disability-Adjusted Life Year) calculated?
(A) By adding Life Expectancy at Birth and Total Fertility Rate
(B) By multiplying the Incidence Rate by the Prevalence Rate
(C) By subtracting Infant Mortality Rate from Crude Birth Rate
(D) By adding years of life lost to years lived with disability

74. Under the Sustainable Development Goals (SDGs), what is the target set for reducing the Under-Five Mortality Rate (U5MR) by 2030?
(A) As low as 50 per 1,000 live births
(B) Zero deaths
(C) As low as 25 per 1,000 live births
(D) Half of the 1990 level

75. In health and morbidity surveys, what is the difference between point prevalence and period prevalence?
(A) Point prevalence measures only fatal cases occurring in a year
(B) Point prevalence applies to rural areas and distant villages
(C) Point prevalence measures new cases while period covers old
(D) Point prevalence measures cases at a single point in time

76. Which of the following statements reflects the general trend of the Infant Mortality Rate (IMR) in Madhya Pradesh over the last decade?
(A) It has steadily increased year by year in the state
(B) It has remained stagnant with no measurable change
(C) It has reached zero across all districts of the

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(B) Plasmodium falciparum
(C) Plasmodium ovale
(D) Plasmodium malariae

26. Fomite-borne transmission refers to the spread of a pathogen through which of the following?
(A) Respiratory droplets expelled during coughing or sneezing
(B) Biological vectors such as mosquitoes, fleas, and ticks
(C) Direct physical contact between infected and susceptible individuals
(D) Contaminated inanimate objects like doorknobs or towels

27. Which of the following is NOT a recognized mode of transmission for the Human Immunodeficiency Virus (HIV)?
(A) Sharing utensils and drinking glasses with an infected person
(B) Sharing of infected needles and contaminated syringes
(C) Unprotected sexual intercourse with an infected partner
(D) Vertical transmission from infected mother to the child

28. Match the waterborne diseases in List I with their causative organisms in List II:
List I: (Waterborne Disease)
P. Cholera
Q. Typhoid
R. Hepatitis A
S. Amoebiasis
List II: (Causative Organism)
1. Salmonella typhi
2. Entamoeba histolytica
3. Vibrio cholerae
4. Hepatovirus A
(A) P-3, Q-1, R-4, S-2
(B) P-1, Q-3, R-2, S-4
(C) P-3, Q-2, R-4, S-1
(D) P-4, Q-1, R-3, S-2

29. Which trend accurately reflects the prevalence of Dengue in Madhya Pradesh in recent years?
(A) It is strictly confined to rural agricultural communities
(B) It has been entirely eradicated from the entire state
(C) It is increasing in rapidly expanding urban centers
(D) It only affects tribal populations of the Satpura range

30. Which vector is primarily responsible for the transmission of both Dengue and Chikungunya?
(A) Anopheles stephensi
(B) Culex tritaeniorhynchus
(C) Phlebotomus argentipes
(D) Aedes aegypti

31. Based on the COVID-19 pandemic experience, what is considered a critical requirement for effective pandemic preparedness?
(A) Centralizing all healthcare facilities in the state capital
(B) Permanently closing international and interstate borders
(C) Robust genomic surveillance and scalable infrastructure
(D) Relying exclusively on traditional medicine for treatment

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32. Consider the following statements and select the correct option:
Statement I: An endemic disease is one that is constantly present at a baseline level within a given geographic area.
Statement II: An epidemic refers to a sudden, widespread outbreak of a disease across multiple countries or continents.
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

33. A zoonotic disease is best defined as an infectious disease that:
(A) A disease originating only in domestic household pets
(B) A disease transmitting between animals and humans
(C) A disease affecting only animals in zoological parks
(D) A disease requiring both a human and an insect host

17. While Madhya Pradesh has achieved the overall elimination target for Leprosy, what remains the primary challenge for the state's health department regarding this disease?
(A) Clustered endemic blocks and late detection challenges
(B) Total resistance developed to Multi-Drug Therapy (MDT)
(C) Spread primarily through contaminated municipal supplies
(D) A new vector species transmitting the disease in cities

18. Which of the following is NOT a characteristic of the measles virus transmission?
(A) It requires a biological vector to complete its life cycle before infecting humans
(B) It is highly contagious and spreads primarily via the airborne route
(C) It can remain active and contagious in the air or on infected surfaces for up to two hours
(D) Infected people can spread measles from four days before through four days after the rash appears

19. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Japanese Encephalitis cases in Madhya Pradesh are predominantly reported from the eastern and north-eastern districts.
Reason (R): These districts have a higher concentration of paddy cultivation and pig farming, which act as breeding grounds for Culex mosquitoes and amplifying hosts for the virus, respectively.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

20. Consider the following statements regarding Malaria transmission:
I. It is caused by the Plasmodium parasite.
II. It is transmitted by the bite of infected male Anopheles mosquitoes.
III. The parasite multiplies in the human liver before infecting red blood cells.
Which of the combinations is correct?
(A) I and III only
(B) I and II only
(C) II and III only
(D) I, II, and III

21. Identify the odd one out regarding the primary mode of transmission among the following viral infections.
(A) Hepatitis B
(B) Hepatitis C
(C) Hepatitis A
(D) HIV

22. A patient acquires an infection after receiving a blood transfusion from an infected donor. This is an example of which mode of disease transmission?
(A) Vector-borne transmission
(B) Vehicle-borne transmission
(C) Airborne transmission
(D) Fecal-oral transmission

23. Which of the following statements about Hepatitis A is correct?
(A) It frequently leads to chronic liver disease and cirrhosis
(B) It requires coinfection with the Hepatitis D virus to replicate
(C) It is a zoonotic disease predominantly found in cattle
(D) It is primarily transmitted through the fecal-oral route

24. What is the epidemiological benchmark for considering Leprosy as "eliminated" as a public health problem at the state or national level?
(A) Zero new cases reported for five consecutive years
(B) Total eradication of the bacterium from the environment
(C) Vaccination of 100% of the population against Leprosy
(D) Prevalence rate of less than 1 case per 10,000 people

25. Which species of the Malaria parasite is responsible for the majority of severe and fatal malaria cases in Madhya Pradesh's tribal belt?
(A) Plasmodium vivax

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43. The herd immunity threshold (the percentage of the population that must be immune to prevent an outbreak) is highest for diseases that are:
(A) Mild in severity with a low basic reproduction number
(B) Highly infectious with a large reproduction number
(C) Transmitted exclusively by specific mosquito vectors
(D) Caused by bacterial agents rather than viral ones

44. Under the Universal Immunization Programme (UIP) in India, the BCG vaccine is administered to protect against which disease, and via which route?
(A) Polio; Oral route
(B) Measles; Subcutaneous route
(C) Hepatitis B; Intramuscular injection route
(D) Tuberculosis; Intradermal route

45. Which of the following is typically NOT a direct responsibility of the District Health Officer during an epidemic?
(A) Activating the district control room for monitoring
(B) Supervising contact tracing and surveillance activities
(C) Developing clinical protocols for experimental drugs
(D) Providing accurate health advisories to the community

46. What is the basis of the "Syndromic Management" approach used in public health facilities for treating STIs?
(A) Treating patients based on laboratory pathogen confirmation
(B) Treating patients based on clinical signs and symptoms
(C) Treating only the secondary complications of the infection
(D) Isolating the patient until the infection resolves naturally

47. What is the fundamental difference between "Quarantine" and "Isolation" in public health?
(A) Quarantine applies to animals, while isolation applies to humans
(B) Quarantine restricts healthy contacts; isolation separates the sick
(C) Quarantine separates sick people; isolation restricts healthy people
(D) Quarantine is done at home; isolation is strictly done in hospitals

48. Which of the following correctly defines a "re-emerging" infectious disease?
(A) A newly recognized disease never before infecting humans
(B) A known disease increasing in prevalence after a decline
(C) A historical disease that has been globally eradicated
(D) A disease that only affects specific aging populations

49. Match the epidemiological terms in List I with their definitions in List II:
List I: (Epidemiological Term)
P. Epidemic
Q. Endemic
R. Pandemic
S. Sporadic
List II: (Definition)
1. Disease occurring infrequently and irregularly
2. Constant presence of a disease within a geographic area
3. Worldwide spread of a new disease
4. Sudden increase in disease cases above expected levels in a specific area
(A) P-4, Q-2, R-3, S-1
(B) P-2, Q-4, R-3, S-1
(C) P-4, Q-2, R-1, S-3
(D) P-3, Q-2, R-4, S-1

50. Consider the following statements regarding the National Immunization Schedule in India:
I. Hepatitis B birth dose must be given within 24 hours of birth.
II. Fractional Inactivated Poliovirus Vaccine (fIPV) is administered intradermally.
III. The Pentavalent vaccine is given at 6, 10, and 14 weeks of age.
IV. Vitamin A first dose is given along with the first dose of Measles-Rubella (MR) vaccine.
V. Tetanus Toxoid is completely phased out and replaced by Tetanus and adult Diphtheria (Td) vaccine.
Which combination is correct?
(A) I, II, III, and V only

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(B) I, III, IV, and V only
(C) I, II, III, IV, and V
(D) II, III, IV, and V only

51. Among the following, identify the odd one out based on the category of health indicators.
(A) Infant Mortality Rate
(B) Maternal Mortality Ratio
(C) Life Expectancy at Birth
(D) Number of doctors per 10,000

52. Which structural component of the SARS-CoV-2 virus was the primary target for most COVID-19 vaccines deployed in India?
(A) Nucleocapsid protein component
(B) Viral envelope protein structure
(C) Membrane protein architecture
(D) Surface spike glycoprotein

53. What is the most significant anthropogenic cause of the growing global threat of Antimicrobial Resistance (AMR)?
(A) The increased use of vaccines in children
(B) The chlorination of municipal water supplies
(C) Excessive use of antibiotics in humans and animals
(D) The use of insecticidal nets to prevent malaria

54. Which advanced digital platform is systematically replacing the traditional IDSP portal to provide real-time, case-based data on outbreak-prone diseases in India?
(A) CoWIN digital platform for national vaccination
(B) e-Sanjeevani portal for online tele-consultation
(C) Integrated Health Information Platform
(D) NIKSHAY portal for tracking tuberculosis cases

55. Why does herd immunity NOT apply to a disease like Tetanus?
(A) Tetanus is contracted from environmental exposure
(B) Tetanus mutates too rapidly for immune recognition
(C) The Tetanus vaccine only provides lifelong protection
(D) Tetanus only affects livestock and various animals

56. A farmer in Madhya Pradesh presents with high fever, muscle pain, and jaundice after working bare-legged in waterlogged paddy fields. Which zoonotic disease is most strongly suspected?
(A) Leptospirosis
(B) Rabies
(C) Brucellosis
(D) Avian Influenza

57. What is the primary role of a District Health Officer (DHO) / Chief Medical and Health Officer (CMHO) during an infectious disease outbreak?
(A) Coordinating the local response and resource allocation
(B) Personally performing laboratory tests on all patient samples
(C) Manufacturing required vaccines at the district hospital level
(D) Drafting national health policies for the central government

58. Arrange the following events leading to Antimicrobial Resistance (AMR) in the correct chronological order:
I. The resistant bacteria survive and multiply.
II. Antibiotics are introduced into the host to treat an infection.
III. Susceptible bacteria are killed by the antibiotic.
IV. A random genetic mutation occurs in a few bacteria, rendering them resistant.
V. The resistant trait is shared with other bacteria via horizontal gene transfer.
(A) II, III, IV, I, V
(B) IV, II, III, I, V
(C) IV, III, II, I, V
(D) II, IV, I, III, V

59. What is the primary objective of the Integrated Disease Surveillance Programme (IDSP) in India?
(A) Providing free medical treatment to all citizens in rural areas
(B) Distributing vaccines against various non-communicable diseases
(C) Decentralized surveillance for early outbreak response
(D) Eradicating all vector-borne diseases on a

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global scale

60. Identify the incorrect statement regarding the immunization schedule in India.
(A) The zero dose of Oral Polio Vaccine (OPV) is given at birth.
(B) The first dose of the Measles-Rubella (MR) vaccine is administered immediately at birth.
(C) The Pentavalent vaccine protects against five diseases: Diphtheria, Pertussis, Tetanus, Hepatitis B, and Hib.
(D) Rotavirus vaccine is administered in liquid form orally.

61. A state observes a rapidly declining Death Rate but a persistently high Birth Rate, leading to population explosion. Which stage of the Demographic Transition Theory does this represent?
(A) Stage 1 (High Stationary)
(B) Stage 2 (Early Expanding)
(C) Stage 3 (Late Expanding)
(D) Stage 4 (Low Stationary)

62. While DALY measures the burden of disease, QALY (Quality-Adjusted Life Year) is primarily used to evaluate:
(A) Evaluation of medical interventions and life quality gained
(B) The number of years a person lives without a stable job
(C) The total economic cost of state hospital infrastructure
(D) The total fertility rate of a specific ethnic community

63. What is the denominator used when calculating the Maternal Mortality Ratio (MMR)?
(A) 100,000 live births
(B) 1,000 live births
(C) 1,000 women of reproductive age
(D) Total population of the region

64. Consider the following statements regarding the Sample Registration System (SRS) in India:
I. It operates on a dual-record system.
II. It provides independent estimates of birth rate and death rate at both the national and state levels.
III. It conducts continuous enumeration of births and deaths by a resident part-time enumerator.
IV. It only collects data from urban metropolitan cities.
Which of the combinations is correct?
(A) I, III, and IV only
(B) II, III, and IV only
(C) I, II, and III only
(D) I, II, and IV only

65. What is globally and nationally recognized as the leading cause of death among children under five years of age?
(A) Malnutrition and respiratory or diarrheal infections
(B) Chronic Tuberculosis
(C) Congenital heart defects
(D) Vector-borne diseases

66. Consider the following statements and select the correct option:
Statement I: Incidence rate measures the number of new cases of a disease occurring in a population during a specified period.
Statement II: Prevalence rate measures the total number of existing cases (both old and new) in a population at a given time.
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

67. What constitutes the numerator in the calculation of the Infant Mortality Rate (IMR)?
(A) Number of stillbirths in a given year
(B) Number of deaths of children under 5 years of age in a given year
(C) Number of infant deaths (under 1 year of age) in a given year
(D) Number of neonatal deaths (under 28 days of age) in a given year

68. Identify the incorrect statement regarding the Crude Birth Rate (CBR).
(A) It measures the number of live births per 1,000 mid-year population in a given year.
(B) It provides a precise measure of the fertility

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34. A person arriving in Bhopal from an international flight where a fellow passenger tested positive for a highly contagious virus shows no symptoms. Which public health measure is most appropriate for this person?
(A) Immediate Isolation
(B) Intensive Care admission
(C) Administration of broad-spectrum antibiotics
(D) Quarantine

35. Which of the following is NOT a recommended strategy to combat Antimicrobial Resistance (AMR)?
(A) Promoting the sale of antibiotics over-the-counter without a prescription
(B) Enhancing infection prevention and control practices in hospitals
(C) Optimizing the use of antimicrobial medicines in human and animal health
(D) Investing in research and development of new antibiotics

36. A reliable health indicator must have the ability to measure what it actually intends to measure. This characteristic is known as:
(A) Validity
(B) Sensitivity
(C) Feasibility
(D) Specificity

37. Which of the following correctly pairs a Sexually Transmitted Infection (STI) with its causative agent?
(A) Trichomoniasis - Trichomonas vaginalis
(B) Syphilis - Neisseria gonorrhoeae
(C) Gonorrhea - Treponema pallidum
(D) Chlamydia - Human Papillomavirus

38. What is the concept of "Herd Immunity" in epidemiology?
(A) Natural immunity developed after surviving an infection
(B) Immunity exclusively transferred via maternal breast milk
(C) The rapid mutation of a virus to evade immune systems
(D) Indirect protection when a population becomes immune

39. Under the IDSP, disease surveillance is classified into three types. Which of the following is NOT one of those types?
(A) Syndromic Surveillance
(B) Presumptive Surveillance
(C) Confirmed Surveillance
(D) Speculative Surveillance

40. Which of the following is an example of an emerging infectious disease that has caused intermittent outbreaks in India in recent decades?
(A) Smallpox
(B) Polio
(C) Dracunculiasis (Guinea Worm)
(D) Nipah Virus

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41. Arrange the following periods of human life in the correct chronological order as used for calculating mortality indicators:
I. Post-neonatal period
II. Early neonatal period
III. Late neonatal period
IV. Perinatal period
(A) IV, II, III, I
(B) II, III, IV, I
(C) IV, III, II, I
(D) II, IV, III, I

42. Consider the following statements regarding Zoonotic diseases:
I. Rabies is a fatal viral disease primarily transmitted through the bite or scratch of an infected animal.
II. Leptospirosis is commonly contracted through contact with soil or water contaminated by the urine of infected animals.
III. Brucellosis is a bacterial infection most commonly spread by consuming unpasteurized milk or cheese from infected livestock.
IV. Rabies can be cured completely if treated after the onset of clinical symptoms.
Which of the combinations is correct?
(A) I, II, and IV only
(B) II, III, and IV only
(C) I, II, and III only
(D) I, III, and IV only

state
(D) It has declined but remains above the national average

77. Which authority in India is responsible for publishing the Sample Registration System (SRS) statistical reports, which provide reliable annual estimates of demographic indicators?
(A) Ministry of Health and Family Welfare
(B) NITI Aayog (National Institution for Transforming India)
(C) Indian Council of Medical Research (ICMR)
(D) Office of the Registrar General of India

78. Read the following statements and select the correct option:
Statement I: According to recent National Family Health Survey (NFHS-5) data, Madhya Pradesh has achieved a Total Fertility Rate (TFR) below the national average.
Statement II: A decline in TFR generally indicates an improvement in women's education and access to family planning services.
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

79. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): DALY is considered a highly comprehensive indicator of disease burden in a population.
Reason (R): One DALY represents the loss of the equivalent of one full year of healthy life, accounting for both premature death and disability.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

80. Select the correct sequence of the four classical stages of the Demographic Transition Theory:
(A) High Birth & High Death Rate → High Birth & Declining Death Rate → Declining Birth & Declining Death Rate → Low Birth & Low Death Rate
(B) Low Birth & Low Death Rate → High Birth & Declining Death Rate → High Birth & High Death Rate → Declining Birth & Declining Death Rate
(C) Declining Birth & Declining Death Rate → Low Birth & Low Death Rate → High Birth & High Death Rate → High Birth & Declining Death Rate
(D) High Birth & Declining Death Rate → High Birth & High Death Rate → Low Birth & Low Death Rate → Declining Birth & Declining Death Rate

81. Which of the following is NOT typically considered a major gap in the public health infrastructure of Madhya Pradesh?
(A) Shortage of specialist medical professionals at rural centers
(B) Inadequate availability of advanced diagnostic services
(C) An oversupply of tertiary care hospitals in tribal districts
(D) Sub-optimal utilization of maternal services in remote areas

82. In demographic terms, what is considered the "Replacement Level" Total Fertility Rate (TFR)?
(A) 1.5
(B) 2.1
(C) 2.5
(D) 3.0

83. The Under-Five Mortality Rate (U5MR) is defined as the probability per 1,000 live births that a newborn baby will die before reaching:
(A) 1 year of age
(B) 3 years of age
(C) 5 years of age
(D) 10 years of age

84. In the context of child malnutrition indicators in Madhya Pradesh, what does "stunting" indicate?
(A) Low weight for height (acute malnutrition)
(B) Low weight for age (underweight status)

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(C) Low height for age (chronic malnutrition)
(D) Excess weight for height (overweight status)

85. The term "Crude" in Crude Death Rate implies that:
(A) The data collected is raw and unverified
(B) It only estimates deaths from lifestyle diseases
(C) It ignores the age and sex composition
(D) The calculation method is considered outdated

86. Identify the incorrect statement regarding the causes of high Maternal Mortality Ratio (MMR) in states like Madhya Pradesh.
(A) Severe anemia among pregnant women is a major factor
(B) 100% institutional births have eliminated urban deaths
(C) Postpartum hemorrhage is a leading direct cause of death
(D) Delay in seeking or reaching care contributes significantly

87. Why is the Sample Registration System (SRS) historically preferred over the Civil Registration System (CRS) for analyzing vital demographic rates in India?
(A) SRS is conducted weekly whereas CRS is once a decade
(B) CRS suffers from under-registration of vital events
(C) CRS only records marriages and divorces in the state
(D) SRS utilizes satellite imagery to track populations

88. Match the health indicators in List I with the relevant age groups or conditions in List II:
List I: (Health Indicator)
P. Neonatal Mortality
Q. Infant Mortality
R. Under-Five Mortality
S. Maternal Mortality
List II: (Relevant Age Group/Condition)
1. Death before reaching 5 years of age
2. Death during pregnancy or within 42 days of delivery
3. Death within the first 28 days of life
4. Death before the first birthday
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-1, S-2
(C) P-3, Q-1, R-4, S-2
(D) P-2, Q-4, R-1, S-3

89. According to the National Family Health Survey (NFHS-5) data for Madhya Pradesh, what significant trend was observed regarding institutional births compared to NFHS-4?
(A) Institutional births decreased significantly due to lack of facilities
(B) Institutional births increased, reflecting better utilization
(C) Institutional births remained entirely unchanged across the state
(D) Institutional births were completely replaced by home births

90. Which time frame accurately defines the "Early Neonatal Period"?
(A) The first 24 hours after birth
(B) The first 7 days of life
(C) From 7 days to 28 days of life
(D) From 28 days to 1 year of life

91. Which of the following is NOT generally classified as a social determinant of health?
(A) Socioeconomic status
(B) Genetic inheritance
(C) Access to education
(D) Neighborhood and physical environment

92. Identify the correct pair representing the historical context of Madhya Pradesh's demographic classification.
(A) MP is a replacement-level state - TFR below 1.5
(B) MP is a zero-malaria state - Certified by WHO in 2020
(C) MP is an EAG state needing special focus on indicators
(D) MP is an exclusively urban state - Over 90% urban

93. The acute shortage of specialist doctors (like pediatricians and gynecologists) at Community Health Centres (CHCs) in Madhya Pradesh primarily results in which of the following effects?
(A) A dramatic decrease in the state's Crude Death Rate
(B) Complete eradication of vector-borne

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diseases in rural areas
(C) A rise in the number of private engineering colleges
(D) Increased referrals leading to tertiary overcrowding

94. What is the most effective role of improved sanitation in the context of communicable disease control in Madhya Pradesh?
(A) It primarily prevents the spread of airborne viruses like Influenza
(B) It eliminates the need for all pediatric vaccinations
(C) It breaks transmission cycles, reducing diarrheal diseases
(D) It cures existing cases of chronic Tuberculosis in the state

95. Consider the following statements regarding the Social Determinants of Health:
I. Poverty severely limits access to nutritious food, increasing vulnerability to infectious diseases.
II. Poor sanitation and lack of safe drinking water are direct determinants of waterborne diseases like Cholera.
III. Female education levels have a strong inverse relationship with infant and child mortality rates.
IV. Overcrowded living conditions facilitate the airborne transmission of diseases like Tuberculosis.
V. Income inequality has no measurable impact on a population's life expectancy.
Which combination is correct?
(A) I, II, III, and IV only
(B) I, II, III, and V only
(C) II, III, IV, and V only
(D) I, III, IV, and V only

96. Based on the latest Sample Registration System (SRS) data, how does the Infant Mortality Rate (IMR) of Madhya Pradesh compare to the national average?
(A) It is significantly lower than the national average
(B) It is the highest in India, above the national average
(C) It is exactly equal to the national average of the country
(D) It is currently the lowest recorded in the entire country

97. Which organization defines Social Determinants of Health as "the conditions in which people are born, grow, live, work and age"?
(A) World Health Organization (WHO)
(B) World Bank
(C) United Nations Children's Fund (UNICEF)
(D) Food and Agriculture Organization (FAO)

98. How does improving female literacy directly impact the Infant Mortality Rate (IMR) in a state like Madhya Pradesh?
(A) It increases IMR by delaying the age of marriage indefinitely
(B) It decreases IMR by increasing healthcare awareness
(C) It has no impact on IMR as biological factors determine survival
(D) It decreases IMR by increasing biological immunity genetically

99. The NITI Aayog's State Health Index assesses the overall performance of states. Historically, in which tier does Madhya Pradesh typically rank regarding overall health outcomes?
(A) Among the top three best-performing states in India
(B) Exactly in the middle of the ranking for all states
(C) It is currently exempted from the national index
(D) Among lower-ranking states requiring improvements

100. The historical acronym "BIMARU" was coined to describe states that lagged in demographic and economic indicators. Madhya Pradesh was included in this group primarily due to its historically high rates of:
(A) Literacy and urbanization
(B) Industrial growth and migration
(C) Foreign direct investment
(D) Infant mortality and fertility

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1. (D) Inhalation of droplet nuclei containing bacteria
Tuberculosis is an infectious bacterial disease caused by Mycobacterium tuberculosis. It primarily affects the lungs and spreads when an infected person coughs, sneezes, or speaks, releasing tiny respiratory droplets into the air. When a susceptible person inhales these droplet nuclei containing the bacteria, the infection can establish itself within the new host.

2. (C) Eastern districts bordering Uttar Pradesh state
Madhya Pradesh shares a significant border with Uttar Pradesh, where Japanese Encephalitis is highly endemic. The eastern districts are geographically contiguous with these zones. Factors such as extensive paddy cultivation and widespread pig farming provide ideal conditions for the breeding of Culex mosquitoes and serve as reservoirs for the virus, increasing local vulnerability to outbreaks.

3. (C) Tetanus
Tetanus is a serious infectious disease caused by the bacterium Clostridium tetani. The spores of these bacteria are commonly found in soil, dust, and animal feces. Unlike most infectious diseases, it cannot be transmitted from one person to another. It typically enters the body through deep puncture wounds, burns, or other injuries that break the skin.

4. (A) Exposure, Incubation period, Prodromal stage, Clinical illness, Convalescence
The progression of an infectious disease follows a distinct path. It begins with exposure to the pathogen, followed by the incubation period where the organism multiplies without symptoms. The prodromal stage brings vague, early symptoms, leading into the clinical illness phase with specific diagnostic signs. Finally, the convalescence stage marks the period of recovery and health restoration.

5. (B) Monsoon and immediate post-monsoon
Waterborne diseases like cholera and typhoid are most prevalent during the monsoon season. Heavy rainfall often leads to the flooding of sanitation systems and the contamination of drinking water sources with fecal matter. These documentation facilitate the rapid spread of pathogens. The stagnant water and high humidity following the rains further contribute to the persistence of these outbreaks.

6. (B) National AIDS Control Programme (NACP)
The National AIDS Control Programme is a comprehensive initiative launched by the Government of India to curb the spread of HIV. It focuses on prevention, providing access to antiretroviral therapy, and reducing the stigma associated with the disease. The programme operates through state-level societies to implement targeted interventions for high-risk groups and ensure blood safety across the country.

7. (B) A disease caused by pathogens spread directly or indirectly
An infectious disease is defined by its etiology, being caused by pathogenic microorganisms such as bacteria, viruses, fungi, or parasites. These diseases can be spread through various means, including direct physical contact, respiratory droplets, or contaminated vehicles like food and water. They are distinguished from non-communicable diseases, which result from genetic, physiological, environmental, or behavioral factors.

8. (B) Specific terrain and practices facilitating transmission
Tribal districts in Madhya Pradesh often feature dense forests and hilly terrains that create natural breeding grounds for mosquitoes. Socio-economic factors and traditional living practices in these regions can increase exposure to vectors. Furthermore, migratory patterns and limited access to preventive measures in remote areas contribute to a higher sustained prevalence of malaria compared to other geographic regions.

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9. (B) Poor waste management and water storage practices
The rise of dengue in urban areas is closely linked to rapid and unplanned urbanization. Aedes aegypti mosquitoes, the primary vectors, thrive in artificial containers such as discarded tires, plastic containers, and uncovered water storage tanks. Inadequate waste disposal and irregular water supply lead residents to store water in ways that provide ideal breeding sites for these specific mosquito species.

10. (C) Chickenpox - Protozoan
Chickenpox is a highly contagious disease caused by the varicella-zoster virus, not a protozoan. It is characterized by an itchy skin rash and fluid-filled blisters. Like measles and influenza, it is primarily an airborne disease spread through respiratory droplets or direct contact with the rash. Identifying the correct causative agent is vital for determining appropriate medical treatments and vaccinations.

11. (A) P-4, Q-3, R-2, S-1
Hepatitis A and E are primarily transmitted via the fecal-oral route, often through contaminated water, with Hepatitis E being particularly severe during pregnancy. Hepatitis B and C are blood-borne infections. While Hepatitis B can be prevented through vaccination and is spread via body fluids, Hepatitis C carries the highest risk of developing into a chronic liver condition over time.

12. (C) Large respiratory droplets falling quickly within a short range
Droplet transmission occurs when an infected person coughs or sneezes, releasing large respiratory particles into the environment. Because of their size and weight, these droplets do not remain suspended in the air for long. They typically travel only a short distance, usually less than one meter, before falling onto surfaces or being inhaled by individuals in close proximity.

13. (A) Distribution of LLINs and Indoor Residual Spraying
To combat malaria in high-endemic tribal areas, health authorities focus on vector control strategies. Long-Lasting Insecticidal Nets provide a physical and chemical barrier against mosquitoes during sleep. Indoor Residual Spraying involves applying insecticides to the interior walls of homes to kill mosquitoes that rest there. These interventions are critical for reducing the transmission rate in vulnerable, remote communities.

14. (C) Stagnant water bodies acting as mosquito breeding sites
Following the monsoon season, the accumulation of stagnant water in ditches, containers, and natural depressions provides perfect environments for mosquitoes to lay eggs. This results in a significant increase in the vector population. Consequently, the transmission of diseases like malaria, dengue, and chikungunya peaks as these mosquitoes find more opportunities to bite humans and spread the respective pathogens.

15. (D) Period before HIV antibodies become detectable by tests
The window period in HIV epidemiology is the time interval between the initial infection and the point when diagnostic tests can reliably detect the virus or its antibodies. During this phase, an individual is highly infectious despite potentially testing negative. The length of this period varies depending on the type of test used, such as antibody-based or nucleic acid tests.

16. (A) They are transmissible from an infected source to a host
The defining characteristic of a communicable disease is its ability to be transmitted from one person, animal, or environmental reservoir to another susceptible host. This transmission can occur through direct contact, airborne droplets, or intermediate vehicles and vectors. In contrast, non-communicable diseases are generally non-infectious and arise from internal health factors, lifestyle choices, or long-term environmental exposures.

17. (A) Clustered endemic blocks and late detection challenges
Although Madhya Pradesh has met the official threshold for leprosy elimination, certain geographic areas still report high case numbers. These clustered endemic blocks require focused surveillance. A major ongoing challenge is late detection, which can lead to permanent physical disabilities and continued community

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immune system to recognize and attack this specific structure, vaccines can prevent the virus from causing an infection. This target was chosen because it is highly visible to the immune system.

53. (C) Excessive use of antibiotics in humans and animals
The primary driver of antimicrobial resistance is the widespread and often inappropriate use of antibiotic drugs. In human medicine, they are frequently prescribed for viral infections where they have no effect. In agriculture, they are used for growth promotion in livestock. This constant exposure allows bacteria to develop defense mechanisms, making standard treatments ineffective and leading to more difficult-to-treat infections globally.

54. (C) Integrated Health Information Platform
The Integrated Health Information Platform is a next-generation digital system designed to modernize disease surveillance in India. It provides real-time, case-based electronic data entry, which is a significant advancement over the older, paper-heavy reporting systems. This allows health officials to detect and respond to potential outbreaks much faster, improving the overall efficiency of the Integrated Disease Surveillance Programme across all states.

55. (A) Tetanus is contracted from environmental exposure
Herd immunity only works for diseases that spread from person to person. Tetanus is not communicable between humans; it is caused by spores found in the environment, such as in soil. Because an individual can only be protected by their own immune response following vaccination, a high level of community vaccination does not provide any indirect protection to those who remain unvaccinated.

56. (A) Leptospirosis
Leptospirosis is a zoonotic disease often associated with agricultural work in waterlogged conditions. The bacteria are shed in the urine of infected animals, like rodents or cattle, and can survive in water and soil. Farmers working in paddy fields are at high risk as the bacteria enter the body through small cuts or mucous membranes, leading to symptoms like fever and jaundice.

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57. (A) Coordinating the local response and resource allocation
During an infectious disease outbreak, the primary role of the District Health Officer is one of leadership and administration. They must ensure that surveillance is active, medical supplies are distributed, and healthcare teams are properly deployed. They act as the central point of contact for the local government, translating health data into actionable strategies to contain the spread of the disease within the district.

58. (B) IV, II, III, I, V
The development of antimicrobial resistance is a multi-step evolutionary process. It begins with a random genetic mutation in a few bacteria. When antibiotics are introduced, they kill the susceptible organisms, leaving the resistant ones to survive and multiply. Over time, these resistant bacteria can transfer their genetic traits to other bacteria, spreading the resistance throughout the population and making treatments less effective.

59. (C) Decentralized surveillance for early outbreak response
The Integrated Disease Surveillance Programme was established to create a robust, decentralized system for monitoring disease trends across India. By collecting data at the local level and using it to detect early warning signs of outbreaks, the programme enables health authorities to take rapid action. This proactive approach is essential for containing infectious diseases before they can escalate into large-scale, uncontrollable public health emergencies.

60. (B) The first dose of the Measles-Rubella (MR) vaccine is administered immediately at birth.
In the Indian immunization schedule, the measles-rubella vaccine is not given at birth because maternal antibodies can interfere with its effectiveness. Instead, the first dose is typically administered between nine and twelve months of age, with a second dose given during the second year of life. Vaccines like the oral polio zero dose and the Hepatitis B birth dose are given at birth.

61. (B) Stage 2 (Early Expanding)
The second stage of the demographic transition is characterized by a high and stable birth rate accompanied by a rapidly declining death rate. This decline is usually due to improvements

personal items. After touching the contaminated surface, the individual may transfer the pathogen to their mouth, nose, or eyes. This indirect route is a common way many respiratory and enteric diseases spread.

27. (A) Sharing utensils and drinking glasses with an infected person
The Human Immunodeficiency Virus is transmitted through specific body fluids, including blood, semen, vaginal secretions, and breast milk. It cannot be spread through casual, non-sexual contact such as hugging, shaking hands, or sharing food and drinking utensils. Understanding these specific routes is crucial for both preventing new infections and reducing the social stigma faced by people living with the virus.

28. (A) P-3, Q-1, R-4, S-2
Waterborne diseases are caused by various types of microorganisms. Cholera is caused by the bacterium Vibrio cholerae, while typhoid fever is caused by Salmonella typhi. Hepatitis A results from an infection by the Hepatovirus A. Amoebiasis is a parasitic infection caused by the protozoan Entamoeba histolytica. All these pathogens are typically spread through the ingestion of contaminated water or food.

29. (C) It is increasing in rapidly expanding urban centers
Recent data shows that dengue is becoming more prevalent in the urban areas of Madhya Pradesh. This trend is driven by high population density, rapid urban growth, and the proliferation of man-made containers that serve as breeding sites for mosquitoes. Unlike some diseases that are restricted to rural or tribal belts, the urban environment provides the necessary conditions for dengue outbreaks.

30. (D) Aedes aegypti
Aedes aegypti is the primary mosquito vector for several significant viral diseases, including both dengue and chikungunya. These mosquitoes are highly adapted to urban environments and typically bite during the daytime. Because they breed in small amounts of clean, stagnant water found around households, community-led source reduction and environmental management are the most effective ways to control the spread of these diseases.

31. (C) Robust genomic surveillance and scalable infrastructure
Lessons from the COVID-19 pandemic emphasize the need for advanced health systems. Genomic surveillance is vital for identifying new viral variants that might escape immunity or cause more severe disease. Additionally, infrastructure must be scalable to handle sudden surges in patients. These elements ensure that the health system can respond effectively to emerging threats without collapsing under the increased demand.

32. (C) Statement I is correct but Statement II is incorrect
An endemic disease is one that is permanently established at a steady level within a specific population or region. An epidemic occurs when there is a sudden, unexpected increase in cases in a particular area. A pandemic, which Statement II incorrectly defines as an epidemic, is actually an epidemic that has spread across several countries or continents, affecting many people.

33. (B) A disease transmitting between animals and humans
Zoonotic diseases, or zoonoses, are infections that are naturally transmitted from vertebrate animals to humans. These can be caused by bacteria, viruses, parasites, or fungi. Humans can become infected through direct contact with animals, through contaminated food or water, or via intermediate vectors like ticks and mosquitoes. They represent a significant portion of both existing and emerging infectious disease threats.

34. (D) Quarantine
Quarantine is a public health measure used to restrict the movement of people who have been exposed to a contagious disease but do not yet show any symptoms. The goal is to monitor them for the duration of the incubation period to prevent potential spread. This differs from isolation, which is the separation of people who are already known to be ill.

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35. (A) Promoting the sale of antibiotics over-the-counter without a prescription
Selling antibiotics without a medical prescription is a major driver of antimicrobial resistance. It leads to the inappropriate use of these drugs for viral infections or in incorrect dosages. Effective strategies to combat resistance include improving infection control, optimizing the use of existing medicines, and investing in new drug research. Restricting over-the-counter sales is essential to ensure antibiotics remain effective for future use.

36. (A) Validity
Validity refers to the extent to which a health indicator accurately measures the specific concept or condition it is intended to represent. For example, a valid diagnostic test correctly identifies those with the disease. This characteristic ensures that the data collected is meaningful and can be used to make informed decisions regarding public health interventions, resource allocation, and policy development.

37. (A) Trichomoniasis - Trichomonas vaginalis
Trichomoniasis is a common sexually transmitted infection caused by the parasite Trichomonas vaginalis. In contrast, syphilis is caused by the bacterium Treponema pallidum, and gonorrhea is caused by Neisseria gonorrhoeae. Chlamydia is caused by Chlamydia trachomatis. Accurate identification of these causative agents is fundamental for providing the correct antibiotic or antiparasitic treatment to patients and preventing further transmission.

38. (D) Indirect protection when a population becomes immune
Herd immunity occurs when a large enough portion of a population becomes immune to an infectious disease, either through vaccination or previous infection. This makes the spread of the disease from person to person unlikely. As a result, even individuals who cannot be vaccinated, such as those with certain medical conditions, receive a level of indirect protection because the pathogen lacks hosts.

39. (D) Speculative Surveillance
The Integrated Disease Surveillance Programme utilizes three distinct types of surveillance to monitor outbreaks. Syndromic surveillance relies on clinical symptoms reported by health workers. Presumptive surveillance is based on a clinician's diagnosis without laboratory confirmation. Confirmed surveillance requires positive results from standardized laboratory tests. Speculative surveillance is not a recognized or used methodology within this structured public health monitoring system in India.

40. (D) Nipah Virus
The Nipah virus is an example of an emerging zoonotic disease that has caused several fatal outbreaks in India recently. It is typically transmitted from bats to humans or through contaminated food. While diseases like smallpox and polio have been eradicated or nearly eliminated, emerging viruses like Nipah present new challenges because there are often no established vaccines or effective treatments available.

41. (A) IV, II, III, I
Mortality indicators are categorized by the age of the child. The perinatal period covers late pregnancy and the first week of life. The early neonatal period specifically focuses on the first seven days. The late neonatal period extends from seven to twenty-eight days. Finally, the post-neonatal period covers the remainder of the first year. This sequence provides a detailed view of infant survival.

42. (C) I, II, and III only
Rabies, leptospirosis, and brucellosis are all significant zoonotic diseases. Rabies is virtually always fatal once clinical symptoms appear, making early post-exposure prophylaxis essential. Leptospirosis is often linked to water contaminated by animal urine, and brucellosis spreads through unpasteurized dairy. Because rabies currently has no cure after symptoms manifest, the fourth statement in the original combination is factually incorrect for medical practice.

43. (B) Highly infectious with a large reproduction number
The herd immunity threshold is the percentage of the population that must be immune to stop a disease from spreading. This threshold is mathematically linked to the basic reproduction number of the pathogen. For highly contagious diseases like measles, which have a very high

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reproduction number, a much larger proportion of the population must be vaccinated to achieve effective community-level protection.

44. (D) Tuberculosis; Intradermal route
The Bacillus Calmette-Guérin vaccine is primarily used to protect infants against severe forms of tuberculosis, such as tubercular meningitis. Under India's national schedule, it is administered as soon as possible after birth. The vaccine is unique because it must be delivered via an intradermal injection, usually in the upper left arm, to ensure the development of a proper immune response.

45. (C) Developing clinical protocols for experimental drugs
A District Health Officer is responsible for the administrative and operational management of an outbreak. This includes monitoring surveillance data, coordinating local resources, and issuing public health advisories. However, the development of clinical protocols for experimental drugs is a highly specialized task performed by national research bodies and regulatory agencies, rather than at the district level of the public health hierarchy.

46. (B) Treating patients based on clinical signs and symptoms
Syndromic management of sexually transmitted infections allows healthcare providers to begin treatment immediately based on easily identifiable groups of symptoms, such as discharge or ulcers. This approach is used because laboratory diagnosis can be slow, expensive, or unavailable. By treating the most likely causes of a syndrome right away, the program ensures that patients are cured quickly and the transmission cycle is broken.

47. (B) Quarantine restricts healthy contacts; isolation separates the sick
Quarantine is used for people who have been exposed to an infectious agent but are not yet ill. It keeps them away from others to see if they develop the disease. Isolation, however, is used to separate people who are already confirmed to be infected or showing symptoms. Both are essential public health tools used to prevent the spread of contagious pathogens.

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48. (B) A known disease increasing in prevalence after a decline
A re-emerging infectious disease is one that was previously under control or declining but is now showing an increase in incidence or a geographic spread. This can happen due to factors like antibiotic resistance, changes in human behavior, or gaps in vaccination coverage. Examples include the resurgence of tuberculosis in some areas or the return of measles outbreaks in populations with low immunity.

49. (A) P-3, Q-1, R-4, S-2
Epidemiology uses specific terms to describe disease patterns. An epidemic is an unexpected surge in cases in a specific area. An endemic disease is constantly present at a baseline level in a region. A pandemic describes an epidemic that has spread worldwide. Sporadic refers to cases that occur occasionally and without a predictable pattern. These definitions help health officials monitor and respond to threats.

50. (C) I, II, III, IV, and V
India's National Immunization Schedule is a comprehensive set of guidelines. It includes the Hepatitis B birth dose within twenty-four hours and the use of fractional inactivated poliovirus vaccine delivered intradermally. The pentavalent vaccine is a core component given in three doses. Furthermore, the schedule has evolved to include the measles-rubella vaccine and has transitioned from tetanus toxoid to the adult diphtheria combination.

51. (D) Number of doctors per 10,000
Health indicators are generally divided into different categories. Infant mortality, maternal mortality, and life expectancy at birth are indicators of health outcomes, reflecting the actual health status of the population. The number of doctors per ten thousand people, however, is a resource or input indicator. It measures the availability of healthcare services rather than the health results achieved by those services.

52. (D) Surface spike glycoprotein
Most vaccines developed for COVID-19 target the spike glycoprotein found on the surface of the SARS-CoV-2 virus. This protein is what the virus uses to enter human cells. By training the

transmission. Overcoming the social stigma associated with the disease remains essential for encouraging patients to seek early treatment.

18. (A) It requires a biological vector to complete its life cycle before infecting humans
Measles is a highly contagious viral infection that does not require an animal or insect vector for transmission. It spreads directly from person to person through respiratory droplets or by being suspended in the air. The virus is exceptionally resilient, remaining active on surfaces or in the air for several hours, making it one of the most easily transmitted human diseases.

19. (A) Both A and R are true and R is the correct explanation of A.
Japanese Encephalitis in Madhya Pradesh is concentrated in eastern districts due to specific environmental and agricultural factors. The presence of extensive paddy fields provides the necessary standing water for Culex mosquito breeding. Simultaneously, the common practice of pig farming provides the amplifying hosts required for the virus to reach levels that can then be transmitted to the human population.

20. (A) I and III only
Malaria is a parasitic disease caused by various species of the Plasmodium genus. It is transmitted to humans through the bite of an infected female Anopheles mosquito, which requires blood to develop eggs. After the initial infection, the parasites undergo a mandatory development and multiplication phase in the human liver before they enter the bloodstream to infect red blood cells.

21. (C) Hepatitis A
Hepatitis A is primarily transmitted through the fecal-oral route, typically via contaminated food or water. In contrast, Hepatitis B, Hepatitis C, and HIV are predominantly spread through contact with infected blood, sexual contact, or from mother to child during childbirth. This difference in transmission mode necessitates different public health strategies for prevention, such as improved sanitation versus safe injection practices.

22. (B) Vehicle-borne transmission
Vehicle-borne transmission involves the spread of a pathogen through contaminated inanimate materials or objects, such as water, food, or biological products like blood. In the case of a transfusion-acquired infection, the blood itself acts as the vehicle that carries the infectious agent directly into the recipient's system. This differs from vector-borne transmission, which requires a living organism like an insect.

23. (D) It is primarily transmitted through the fecal-oral route
Hepatitis A is an acute viral infection of the liver that spreads mainly when a person ingests food or water contaminated by the feces of an infected individual. Unlike Hepatitis B or C, it does not typically lead to chronic liver disease and is not spread through respiratory droplets. Vaccination and improved public sanitation are the most effective ways to prevent its spread.

24. (D) Prevalence rate of less than 1 case per 10,000 people
For public health purposes, leprosy is considered eliminated as a major problem when its prevalence falls below one case per ten thousand people. This target was established by the World Health Organization to guide national health programs. Achieving this level indicates that the disease is no longer a significant threat to the general population, although individual cases still require medical attention.

25. (B) Plasmodium falciparum
While multiple species of Plasmodium cause malaria, Plasmodium falciparum is the most dangerous and is prevalent in the tribal regions of Madhya Pradesh. It is responsible for the most severe clinical complications, including cerebral malaria and organ failure. Because it can lead to rapid death if not treated promptly, health programs in these areas prioritize its early diagnosis and effective management.

26. (D) Contaminated inanimate objects like doorknobs or towels
Fomite-borne transmission occurs when a susceptible person touches an inanimate object that has been contaminated by an infectious agent. Common fomites include doorknobs, medical instruments, clothing, and shared

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in food supply and public health. Because the number of births remains high while fewer people are dying, the population grows very quickly, leading to what is often described as a population explosion.

62. (A) Evaluation of medical interventions and life quality gained
Quality-Adjusted Life Years are a measure used in health economics to assess the value of medical treatments. One QALY represents one year of life in perfect health. By looking at how much a treatment improves both the length and the quality of a patient's life, health officials can compare different interventions to determine which provides the most benefit for the resources spent.

63. (A) 100,000 live births
The Maternal Mortality Ratio is a key indicator of the safety of pregnancy and childbirth. It is calculated by dividing the number of maternal deaths by the total number of live births in the same period and then multiplying by one hundred thousand. This standardized denominator allows for the comparison of maternal health outcomes across different regions and over different periods of time.

64. (C) I, II, and III only
The Sample Registration System is a large-scale demographic survey in India that uses a dual-record system. It involves continuous enumeration by local workers and independent half-yearly surveys. This method provides reliable annual estimates of birth and death rates at both national and state levels for rural and urban areas. It is considered more accurate than the civil registration system for tracking these trends.

65. (A) Malnutrition and respiratory or diarrheal infections
Most deaths in children under five are caused by preventable and treatable conditions. Pneumonia and diarrhea remain leading infectious causes, especially when coupled with underlying malnutrition, which weakens the immune system. Neonatal complications, such as preterm birth and birth asphyxia, also contribute significantly. Addressing these issues through vaccination, better nutrition, and improved healthcare access is a top global and national health priority.

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66. (A) Both Statement I and Statement II are correct
Incidence and prevalence are two fundamental measures in epidemiology. Incidence refers only to the number of new cases of a disease that develop in a population over a specific period. Prevalence, on the other hand, includes all individuals living with the disease at a given time, regardless of when they were first diagnosed. Both are necessary to understand the burden of a disease.

67. (C) Number of infant deaths (under 1 year of age) in a given year
The Infant Mortality Rate is calculated using the number of deaths of children who are less than one year old. This number forms the numerator of the equation. This indicator is a sensitive measure of the overall health status of a community, reflecting the quality of prenatal care, nutrition, and the general availability of pediatric health services in a specific region.

68. (B) It provides a precise measure of the fertility of women of childbearing age.
The Crude Birth Rate is a simple measure of the number of births in a population, but it is not a precise measure of fertility. This is because the denominator includes everyone in the population, including men and children who cannot give birth. Factors like the age and sex distribution of the population heavily influence the rate, making it "crude" compared to more specific measures.

69. (A) Prevalence of Anemia
Data from the National Family Health Surveys indicate that anemia remains a persistent public health problem in Madhya Pradesh. Despite various interventions, the prevalence of anemia among children and women actually showed an increase between the fourth and fifth survey rounds. This trend highlights the need for more effective nutritional programs and better access to iron supplementation and diversified diets across the entire state.

70. (C) Average years a newborn is expected to live currently
Life expectancy at birth is a statistical measure of the average number of years a person is expected to live based on current mortality rates. It is a broad indicator of the quality of life and

the effectiveness of the healthcare system in a country. Improvements in sanitation, nutrition, and medical care generally lead to an increase in this figure over time.

71. (A) P-3, Q-4, R-1, S-2
India manages several national health programs targeting specific conditions. The National Leprosy Eradication Programme focuses on leprosy, while the National AIDS Control Programme deals with HIV. Vector-borne diseases like malaria and dengue are managed under a specific combined program. Tuberculosis control is the objective of the National Tuberculosis Elimination Programme. These programs ensure focused resources and standardized treatment protocols for major public health threats.

72. (B) I and III only
The Maternal Mortality Ratio measures deaths during pregnancy or shortly after delivery. Programs like Janani Suraksha Yojana encourage women to give birth in health facilities to reduce these deaths. While Madhya Pradesh has made significant progress in reducing maternal mortality, its ratio has historically remained higher than the national average, meaning the second statement in the combination is factually incorrect.

73. (D) By adding years of life lost to years lived with disability
Disability-Adjusted Life Years are used to measure the total burden of disease on a population. It is calculated by summing two components: the years of life lost due to premature death and the years lived in a state of less-than-full health due to disability. This single metric allows health officials to compare the impact of very different diseases, such as depression and cancer.

74. (C) As low as 25 per 1,000 live births
The Sustainable Development Goals include specific targets for child survival. Goal 3 aims to end preventable deaths of newborns and children under five years of age. Specifically, all countries are encouraged to reduce under-five mortality to at least as low as twenty-five deaths per one thousand live births by the year 2030. Achieving this requires focused improvements in neonatal care and infectious disease control.

75. (D) Point prevalence measures cases at a single point in time
In epidemiology, prevalence measures how common a disease is. Point prevalence looks at the number of cases at one specific moment, like a single day. Period prevalence, in contrast, counts all cases that existed at any time during a longer interval, such as a year. These different measures help health officials understand both the current burden and the long-term impact of various diseases.

76. (D) It has declined but remains above the national average
The Infant Mortality Rate in Madhya Pradesh has shown a consistent downward trend over the past several decades due to better healthcare interventions. However, despite this improvement, the state's rate continues to be higher than the national average for India. This indicates that while progress is being made, there is still a significant need for further investment in maternal and newborn health services.

77. (D) Office of the Registrar General of India
The Office of the Registrar General of India, which operates under the Ministry of Home Affairs, is the official body responsible for the Sample Registration System. It collects and publishes the most reliable annual data on birth rates, death rates, and other vital demographic indicators. These reports are essential for planners and policymakers to monitor health trends and allocate national and state resources effectively.

78. (D) Statement I is incorrect but Statement II is correct
The Total Fertility Rate in Madhya Pradesh has declined significantly, reaching the replacement level of two point one according to recent survey data. However, this is slightly higher than the national average for India, which has fallen even lower. A declining fertility rate is generally a positive sign, reflecting better access to education for women and improved availability of family planning services throughout the region.

79. (A) Both A and R are true and R is the correct explanation of A.
Disability-Adjusted Life Years are recognized as a comprehensive indicator because they account

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for more than just death. By combining the impact of dying too young with the impact of living with a disability, DALYs provide a full picture of the healthy life years lost to a population. This allows for a more accurate assessment of the true burden of various diseases and injuries.

80. (A) High Birth & High Death Rate → High Birth & Declining Death Rate → Declining Birth & Declining Death Rate → Low Birth & Low Death Rate
The theory of demographic transition describes how populations change over time as they modernize. It starts with high birth and death rates, leading to a stable population. As health improves, death rates fall first, causing rapid growth. Later, birth rates also begin to fall. Eventually, both rates reach a low level, resulting in a stable but much older and larger population than before.

81. (C) An oversupply of tertiary care hospitals in tribal districts
Public health infrastructure in Madhya Pradesh faces several challenges, including a shortage of specialist doctors and a lack of advanced diagnostics in rural areas. However, there is certainly not an oversupply of high-level tertiary hospitals in tribal districts. In fact, these remote regions often suffer from the most significant shortages of facilities and medical professionals, leading to difficulties in accessing specialized care.

82. (B) 2.1
The replacement level is the fertility rate at which a population exactly replaces itself from one generation to the next, without any migration. For most modern societies, this rate is considered to be two point one children per woman. Reaching this level is a major milestone in demographic transition, as it indicates that the population will eventually stabilize rather than continuing to grow indefinitely.

83. (C) 5 years of age
The Under-Five Mortality Rate is a critical measure of child survival. It represents the probability that a child born in a specific year will die before reaching their fifth birthday. Because it covers the most vulnerable years of a person's life, it is used as a primary indicator of the overall social and economic development and health status of a country or state.

84. (C) Low height for age (chronic malnutrition)
Stunting is a form of malnutrition where a child is too short for their age. It is a sign of chronic, long-term nutritional deficiency and frequent infections. Unlike acute malnutrition, which causes rapid weight loss, stunting happens over a long period and can have permanent effects on a child's physical and cognitive development. It is a key indicator of long-standing health and nutritional problems.

85. (C) It ignores the age and sex composition
The Crude Death Rate is a simple calculation of the total number of deaths per one thousand people in a year. It is called "crude" because it does not account for the fact that some groups, like the elderly, are naturally at a higher risk of dying. Therefore, two populations could have the same crude death rate but very different underlying health conditions.

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86. (B) 100% institutional births have eliminated urban deaths
While increasing institutional births is a major goal, it is incorrect to say that maternal deaths have been eliminated in urban areas. Even in cities with many hospitals, maternal mortality still occurs due to complications like severe anemia, hemorrhage, or delays in receiving care. Achieving one hundred percent institutional delivery is an important step, but it does not automatically result in zero maternal deaths.

87. (B) CRS suffers from under-registration of vital events
The Civil Registration System in India relies on people voluntarily reporting births and deaths. Historically, this has led to significant under-reporting, especially in rural areas. The Sample Registration System was developed to provide more reliable data through a rigorous dual-reporting method in selected sample areas. This makes it the preferred source for accurately estimating demographic rates across the various states and at the national level.

88. (A) P-3, Q-4, R-1, S-2
Different mortality indicators focus on specific life stages. Neonatal mortality refers to deaths

58. SDG 4 aims to ensure inclusive and equitable quality education. What is the additional component embedded in this goal?
(A) Promoting lifelong learning opportunities for all.
(B) Supporting higher education for the urban elite.
(C) Ensuring universal mandatory military training.
(D) Replacing education solely with digital learning.

59. Which of the following is NOT a recognized source of clean and renewable energy under SDG 7?
(A) Solar Photovoltaic
(B) Wind Turbines
(C) Sub-bituminous Coal
(D) Small Hydro Power

60. A key target of SDG 5 is recognizing and valuing unpaid care and domestic work. This is typically achieved by promoting:
(A) Taxing women who decide to stay at the home.
(B) Shared responsibility within the household.
(C) Prohibiting women from the formal job sector.
(D) Outsourcing domestic work to global companies.

61. Although Madhya Pradesh is a landlocked state, the principles of SDG 14 (Life Below Water) are applied locally through the conservation of:
(A) Local coastal mangrove habitats.
(B) Tropical oceanic coral reef systems.
(C) Freshwater rivers and wetlands.
(D) Protected deep-sea mining regions.

62. The composite score of the NITI Aayog SDG India Index ranges between:
(A) -100 to +100
(B) 0 to 100
(C) 1 to 10
(D) 0 to 1000

63. Match the Sustainable Development Goals in List I with their respective focus areas in List II.
List I: SDGs
P. SDG 5
Q. SDG 6
R. SDG 7
S. SDG 8
List II: Focus Areas
1. Affordable and Clean Energy
2. Clean Water and Sanitation
3. Gender Equality
4. Decent Work and Economic Growth
(A) P-3, Q-2, R-1, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-3, Q-1, R-2, S-4
(D) P-4, Q-2, R-1, S-3

64. The implementation of the PESA (Panchayats Extension to Scheduled Areas) Rules, 2022 in Madhya Pradesh supports SDG localization primarily by:
(A) Centralizing forest management at the state.
(B) Removing panchayats in tribal-majority areas.
(C) Empowering Gram Sabhas with land/water rights.
(D) Moving tribal land to large corporate entities.

65. SDG 16 aims to promote peaceful and inclusive societies, provide access to justice, and build effective, accountable institutions. Which of the following is an explicit target of SDG 16?
(A) Providing legal identity for all citizens.
(B) Removing all corporate entity taxes.
(C) Standardizing a single state language.
(D) Abolishing national military forces.

66. At the national level, which ministry is responsible for developing the National Indicator Framework (NIF) to monitor the progress of SDGs in India?
(A) Ministry of Statistics and Programme Implementation (MoSPI)
(B) Ministry of Finance
(C) Ministry of Home Affairs
(D) Ministry of Rural Development

67. Providing affordable housing for the urban poor through the Pradhan Mantri Awas Yojana (Urban) in MP relates primarily to which SDG?
(A) SDG 2
(B) SDG 5
(C) SDG 11
(D) SDG 13

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of emergency obstetric and newborn services across the state.

97. (A) World Health Organization (WHO)
The World Health Organization is the body that defines social determinants of health as the conditions of daily life. These factors are shaped by the distribution of money, power, and resources at global, national, and local levels. The organization emphasizes that addressing these social factors is just as important as medical treatment for improving the health and life expectancy of populations around the world.

98. (B) It decreases IMR by increasing healthcare awareness
Increasing female literacy has a direct and powerful impact on infant survival. Educated mothers are more likely to be aware of the importance of prenatal care, institutional delivery, and timely vaccinations for their children. They also tend to have better knowledge of nutrition and hygiene. All of these factors combine to significantly reduce the risk of infant death and improve overall family health.

99. (D) Among lower-ranking states requiring improvements
In the State Health Index published by NITI Aayog, Madhya Pradesh typically ranks in the bottom group of large states. While the state has shown improvements in some specific areas, its overall performance in health outcomes, governance, and key processes remains lower than many other states. This ranking serves as a call to action for the state government to prioritize healthcare reforms and investments.

100. (D) Infant mortality and fertility
The acronym BIMARU was historically used to identify Indian states with poor economic and social indicators. Madhya Pradesh was included due to its high birth rates and significant mortality figures. These states faced immense challenges in population control and healthcare delivery, necessitating targeted national interventions to improve maternal and child health outcomes and stabilize the overall population growth in these specific regions.

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resource management
(C) Technological advancement, global trade, and financial security
(D) Poverty reduction, healthcare systems, and educational quality

19. How many goals were included in the Millennium Development Goals (MDGs)?
(A) 8
(B) 10
(C) 15
(D) 17

20. The Johannesburg Summit (2002) heavily emphasized the WEHAB framework. What does WEHAB stand for?
(A) Water, Energy, Health, Agriculture, Biodiversity
(B) Women, Education, Housing, Agriculture, Business
(C) Waste, Environment, Health, Atmosphere, Biosphere
(D) Water, Economy, Habitat, Animals, Botany

21. Which principle emphasizes that progress in one SDG directly influences the success of other SDGs?
(A) The principle of isolation and sector-specific independence
(B) The principle of national sovereignty and localized policy
(C) The principle of interconnectedness and indivisibility
(D) The principle of economic prioritization and market growth

22. What was the formal name of the Brundtland Commission established by the United Nations?
(A) United Nations Environment Programme (UNEP)
(B) World Commission on Environment and Development (WCED)
(C) Intergovernmental Panel on Climate Change (IPCC)
(D) Global Earth Forum (GEF)

23. In which city was the United Nations Conference on Environment and Development (UNCED), widely known as the Earth Summit, held in 1992?
(A) Stockholm
(B) Kyoto
(C) Johannesburg
(D) Rio de Janeiro

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24. What necessitated the transition from the MDGs to the SDGs?
(A) The total failure of the MDGs to achieve any poverty reduction.
(B) The mandate by the World Trade Organization to rewrite development.
(C) The completion of all MDG targets by the beginning of 2010.
(D) The need to integrate ecological, economic, and social dimensions.

25. The outcome document adopted at the Rio+20 Summit was titled:
(A) Our Common Future
(B) The Future We Want
(C) Transforming Our World
(D) Agenda 2030

26. Which of the following best encapsulates the core objective of sustainable development?
(A) Achieving maximum resource extraction for state revenue.
(B) Prioritizing the needs of developing countries over global ecological stability.
(C) Eliminating international trade to reduce carbon footprints.
(D) Balancing growth, social inclusion, and environmental health.

27. On what date did the Sustainable Development Goals officially come into force globally?
(A) 1st September 2015
(B) 1st January 2016
(C) 1st April 2016
(D) 24th October 2015

28. In a policy decision, a state government stops a profitable mining project because it threatens tribal livelihoods and local biodiversity. This decision primarily balances which pillars of sustainable development?
(A) Economic, Social, and Environmental
(B) Economic, Military, and Strategic
(C) Social, Governance, and Political
(D) Environmental, Technical, and Legal

(B) SDGs apply to all nations, whereas MDGs focused on the Global South.
(C) MDGs were drafted by corporations, while NGOs formulated the SDGs.
(D) SDGs are legally binding treaties, whereas the MDGs were voluntary.

10. Find the odd one out regarding the fundamental pillars of sustainable development.
(A) Economic Growth
(B) Environmental Stewardship
(C) Military Superiority
(D) Social Inclusion

11. What is the central transformative promise and motto of the 2030 Agenda for Sustainable Development?
(A) Maximum Growth for All
(B) Protect the Forests First
(C) Zero Carbon by 2030
(D) Leave No One Behind

12. Match the global summits or reports in List I with their respective years in List II.
List I: Global Summits/Reports
P. Brundtland Commission Report
Q. Rio Earth Summit
R. Johannesburg Summit
S. Rio+20 Summit
List II: Years
1. 2002
2. 2012
3. 1987
4. 1992
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-1, R-4, S-2
(C) P-3, Q-4, R-1, S-2
(D) P-2, Q-4, R-3, S-1

13. The concept of the Green Economy, extensively discussed at Rio+20, aims primarily to:
(A) Promote growth while reducing environmental and social risks.
(B) Completely halt the use of all non-renewable resources.
(C) Subsidize agricultural sectors in developing nations.
(D) Replace fiat currency with carbon credits globally.

14. What was the primary focus of Agenda 21?
(A) To set up an international military force to enforce environmental laws.
(B) To ban all fossil fuel extraction by the year 2021.
(C) To outline an action plan for sustainability in the 21st century.
(D) To dictate mandatory population control measures globally.

15. Choose the correct chronological sequence of the following global environmental and developmental milestones.
(A) Earth Summit (Rio), Brundtland Report, Adoption of SDGs, Adoption of MDGs
(B) Adoption of MDGs, Brundtland Report, Earth Summit (Rio), Adoption of SDGs
(C) Brundtland Report, Adoption of MDGs, Earth Summit (Rio), Adoption of SDGs
(D) Brundtland Report, Earth Summit (Rio), Adoption of MDGs, Adoption of SDGs

16. Which of the following statements incorrectly describes the traditional concept of development?
(A) It inherently prioritized the long-term regeneration of natural resources.
(B) It primarily relied on Gross Domestic Product (GDP) as the sole indicator of progress.
(C) It often led to income disparities and social inequalities.
(D) It treated natural resources as limitless raw materials for industrialization.

17. Under which overarching resolution were the Sustainable Development Goals adopted in 2015?
(A) Transforming our world: the 2030 Agenda for Sustainable Development
(B) Agenda 21: The Global Plan for Environment and Future Progress
(C) The Paris Agreement: Combating Global Climate Change Impact
(D) The Kyoto Protocol: Regulating Greenhouse Gas Emissions Daily

18. What are the recognized three pillars of sustainable development?
(A) Economic viability, Social equity, and Environmental protection
(B) Industrial growth, political stability, and

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within the first twenty-eight days. Infant mortality covers the entire first year. Under-five mortality includes all deaths before the fifth birthday. Maternal mortality is specifically related to deaths during pregnancy or shortly after childbirth. Using these distinct categories allows health officials to identify specific problems and target interventions more effectively.

89. (B) Institutional births increased, reflecting better utilization
Recent survey results show a positive trend in healthcare utilization in Madhya Pradesh, with a significant increase in the percentage of births taking place in health facilities. This change is largely attributed to government schemes that provide financial incentives and better transportation for pregnant women. More institutional births generally lead to safer deliveries and better outcomes for both the mother and the newborn child.

90. (B) The first 7 days of life
The early neonatal period is defined as the first seven completed days of an infant's life. This is the most critical time for survival, as many deaths during this period are related to complications from pregnancy or the birth process itself. Focusing on care during this first week is essential for reducing the overall neonatal and infant mortality rates in any given population.

91. (B) Genetic inheritance
Social determinants of health are the non-medical factors that influence health outcomes. These include income levels, education, housing, and the physical environment where people live and work. Genetic inheritance, while it clearly affects an individual's health, is a biological factor rather than a social one. Understanding social determinants is key to addressing health inequalities and improving the overall well-being of a whole population.

92. (C) MP is an EAG state needing special focus on indicators
Madhya Pradesh is classified as one of the Empowered Action Group states in India. These states are characterized by having relatively high population growth and lagging behind in key social and health indicators. Because of this, they receive special attention and increased funding from the central government to help them improve their demographic outcomes and strengthen their public health systems and infrastructure.

93. (D) Increased referrals leading to tertiary overcrowding
When community health centers lack specialists like pediatricians and gynecologists, they are unable to provide many essential services. As a result, patients are frequently referred to larger district or medical college hospitals. This leads to severe overcrowding at these tertiary facilities, which should be focusing on complex cases. Strengthening specialist availability at the local level is necessary to ensure the health system functions efficiently.

94. (C) It breaks transmission cycles, reducing diarrheal diseases
Improved sanitation is one of the most effective ways to control infectious diseases. By ensuring the proper disposal of human waste and providing access to clean water, communities can break the fecal-oral route of transmission. This directly leads to a significant reduction in the incidence of diarrheal diseases like cholera and typhoid, which are major causes of illness and death, particularly among young children.

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95. (A) I, II, III, and IV only
Social determinants like poverty, poor sanitation, and lack of education are major drivers of disease. Overcrowding also plays a huge role in the spread of infections. While the first four statements correctly describe these impacts, income inequality has been proven to have a significant effect on life expectancy. Therefore, the last statement in the original list is incorrect according to established public health research.

96. (B) It is the highest in India, above the national average
Despite ongoing efforts and significant progress, Madhya Pradesh has historically recorded the highest infant mortality rate among all Indian states. This rate is substantially higher than the national average. The high number of infant deaths highlights the need for continued and intensified focus on improving neonatal care, maternal nutrition, and the overall accessibility

29. What was the target year set by the United Nations for achieving the Millennium Development Goals (MDGs)?
(A) 2010
(B) 2012
(C) 2015
(D) 2030

30. The Johannesburg Summit on Sustainable Development held in 2002 is also commonly referred to as:
(A) Rio+5
(B) Rio+20
(C) Stockholm+30
(D) Rio+10

31. SDG 3 aims to ensure healthy lives and promote well-being. A critical global target of SDG 3 is to reduce the global maternal mortality ratio (MMR) to less than:
(A) 20 per 100,000 live births
(B) 50 per 100,000 live births
(C) 70 per 100,000 live births
(D) 100 per 100,000 live births

32. Read the following statements regarding SDG 7 and Madhya Pradesh's energy initiatives:
I. SDG 7 aims for affordable, reliable, sustainable, and modern energy for all.
II. Madhya Pradesh is phasing out all renewable energy projects to focus on coal.
III. The Rewa Ultra Mega Solar project significantly contributes to SDG 7 targets in MP.
IV. Floating solar power plants are being developed at Omkareshwar to boost clean energy.
V. India's first solar city is being developed at Sanchi, Madhya Pradesh.
Which of the above statements are correct?
(A) I, II, III, and V only
(B) I, III, IV, and V only
(C) II, III, and IV only
(D) I, II, IV, and V only

33. The global target for extreme poverty eradication under SDG 1 measures extreme poverty as people living on less than how much per day?
(A) $1.25
(B) $1.90 (updated line often referenced as $2.15)
(C) $5.00
(D) $10.00

34. SDG 9 encompasses three main areas. Which of the following is NOT one of them?
(A) Resilient Infrastructure
(B) Inclusive and Sustainable Industrialization
(C) Innovation
(D) Universal Basic Income

35. Match the Sustainable Development Goals in List I with their respective focus areas in List II.
List I: SDGs
P. SDG 1
Q. SDG 2
R. SDG 3
S. SDG 4
List II: Focus Areas
1. Quality Education
2. Good Health and Well-being
3. Zero Hunger
4. No Poverty
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-2, R-3, S-1
(D) P-1, Q-2, R-3, S-4

36. The Pradhan Mantri Jan Dhan Yojana promotes financial inclusion by ensuring access to banking facilities. This initiative directly supports the reduction of inequalities targeted by which SDG?
(A) SDG 6
(B) SDG 10
(C) SDG 14
(D) SDG 15

37. Which of the following explicitly states the objective of SDG 1?
(A) End poverty in all its forms everywhere
(B) End hunger, achieve food security and improved nutrition
(C) Ensure healthy lives and promote well-being for all at all ages
(D) Reduce inequality within and among countries

38. SDG 6 targets Clean Water and Sanitation for all. The Government of India's Jal Jeevan Mission aligns with this goal by aiming to provide safe

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and adequate drinking water through individual household tap connections by which year?
(A) 2024
(B) 2025
(C) 2030
(D) 2035

39. What is the central theme of SDG 8?
(A) Reduced Inequalities
(B) Responsible Consumption and Production
(C) Peace, Justice, and Strong Institutions
(D) Decent Work and Economic Growth

40. To address a specific health challenge prominent among its tribal population and align with SDG 3, Madhya Pradesh launched a massive screening and management program for which genetic blood disorder?
(A) Hemophilia
(B) Thalassemia
(C) Leukemia
(D) Sickle Cell Anemia

41. Indore's continuous top ranking in the Swachh Survekshan is a prime example of achieving the targets of which SDG regarding sustainable waste management in urban communities?
(A) SDG 7
(B) SDG 11
(C) SDG 14
(D) SDG 16

42. Which specific nutritional issue among children does SDG 2 explicitly seek to end by 2030?
(A) Childhood obesity
(B) Myopia
(C) Stunting and wasting
(D) Dental fluorosis

43. Achieving Open Defecation Free (ODF) status in all villages of Madhya Pradesh is a primary indicator of success for which Sustainable Development Goal?
(A) SDG 3
(B) SDG 6
(C) SDG 11
(D) SDG 15

44. SDG 5 focuses on Gender Equality. Which iconic scheme of Madhya Pradesh fundamentally changed societal attitudes towards the birth of the girl child, deeply aligning with SDG 5?
(A) Mukhya Mantri Kanya Vivah Yojana
(B) Tejaswini Rural Women Empowerment Programme
(C) Usha Kiran Yojana
(D) Ladli Laxmi Yojana

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45. SDG 10 aims to reduce inequality within and among countries. Which statistical metric is most widely used by economists and policymakers to measure income inequality?
(A) Human Development Index (HDI)
(B) Gross National Happiness
(C) Gini Coefficient
(D) Consumer Price Index (CPI)

46. In the context of SDG 1 (No Poverty), which flagship scheme run by the Government of Madhya Pradesh provides comprehensive social security to unorganized sector workers?
(A) Mukhya Mantri Seekho Kamao Yojana
(B) Mukhya Mantri Jan-Kalyan (Sambal) Yojana
(C) Ladli Behna Yojana
(D) CM Rise Yojana

47. A critical indicator for SDG 8 regarding youth is reducing the proportion of youth not in employment, education, or training. This metric is commonly abbreviated as:
(A) YEET
(B) NEET
(C) YNET
(D) ENET

48. The implementation of Ayushman Bharat (Pradhan Mantri Jan Arogya Yojana) in Madhya Pradesh is a direct intervention for achieving Universal Health Coverage. This is an explicit target of which SDG?
(A) SDG 1
(B) SDG 2
(C) SDG 3
(D) SDG 10

49. Which historical town in Madhya Pradesh was declared India's first 'Solar City', setting a benchmark for SDG 7 (Affordable and Clean Energy)?
(A) Sanchi

(B) Khajuraho
(C) Ujjain
(D) Mandu

50. Madhya Pradesh provides 50% reservation for women in Panchayati Raj Institutions (PRIs). This legislative action directly fulfills which target of SDG 5?
(A) Eliminating all harmful practices, such as child marriage.
(B) Ensuring universal access to sexual and reproductive health.
(C) Ensuring participation and equal leadership opportunities.
(D) Reforming rights to give women equal economic resources.

51. SDG 11 aims to make cities and human settlements inclusive, safe, resilient, and sustainable. Which mission in Madhya Pradesh heavily drives this goal in urban areas like Indore and Bhopal?
(A) PM Kisan Samman Nidhi
(B) National Rural Livelihood Mission
(C) PM Fasal Bima Yojana
(D) AMRUT and Smart Cities Mission

52. Madhya Pradesh's 'Mukhya Mantri Bal Arogya Samvardhan Program' is most closely aligned with reducing malnutrition targets set under which SDG?
(A) SDG 1
(B) SDG 2
(C) SDG 4
(D) SDG 7

53. To improve the quality of school education and infrastructure in alignment with SDG 4, the Madhya Pradesh government has initiated the development of world-class integrated schools known as:
(A) Eklavya Model Schools
(B) Navodaya Vidyalayas
(C) CM Rise Schools
(D) Shramodaya Vidyalayas

54. To promote Decent Work and Economic Growth (SDG 8), the Madhya Pradesh government emphasizes the MSME sector. MSME stands for:
(A) Medium, Small and Marginal Enterprises
(B) Manufacturing, Services and Mining Enterprises
(C) Micro, Small and Medium Enterprises
(D) Mega, Small and Micro Enterprises

55. In the context of SDG 6 and the Jal Jeevan Mission, which district of Madhya Pradesh became the first 'Har Ghar Jal' certified district in India?
(A) Burhanpur
(B) Indore
(C) Bhopal
(D) Jabalpur

56. Read the following statements regarding Sustainable Development Goal (SDG) 2 and food security in Madhya Pradesh:
I. SDG 2 aims to end hunger and promote sustainable agriculture.
II. Madhya Pradesh promotes the cultivation of millets like Kodo-Kutki to enhance nutritional security.
III. The Public Distribution System (PDS) in MP has no role in achieving SDG 2 targets.
IV. The State's promotion of organic farming aligns with the sustainable agriculture component of SDG 2.
Which of the above statements is incorrect?
(A) III only
(B) I and II
(C) II and IV
(D) I, III, and IV

57. Arrange the following steps typically involved in localizing SDGs at the district level in Madhya Pradesh in the correct logical sequence:
I. Mapping state schemes to relevant SDG targets
II. Setting district-specific baselines and indicator targets
III. Sensitization and capacity building of local government officials
IV. Regular monitoring through District Planning Committees
Which of the following represents the correct sequence?
(A) III, I, II, IV
(B) I, III, II, IV
(C) II, I, IV, III
(D) I, II, III, IV

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CHAPTER 09
Sustainable Development and SDGs

1. The Brundtland Commission's seminal 1987 report, which popularized the concept of sustainable development, was published under which title?
(A) The Limits to Growth
(B) Agenda 21
(C) The Future We Want
(D) Our Common Future

2. Given below are two statements, one is labelled as Assertion (A) and the other as Reason (R):
Assertion (A): The Millennium Development Goals (MDGs) were criticized for lacking universality.
Reason (R): The MDGs were primarily targeted at developing nations, whereas developed nations were mainly viewed as donors.
Select the correct answer:
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

3. How is sustainable development formally defined in global policy discourse?
(A) Progress that halts industrial growth to preserve the environment.
(B) Progress that focuses on rapid economic expansion for the poor.
(C) Progress meeting current needs without harming future capacity.
(D) Progress that returns society to pre-industrial consumption levels.

4. The SDGs were formally adopted during the UN General Assembly held in:
(A) January 2016
(B) December 2014
(C) September 2015
(D) March 2015

5. Read the following statements regarding Agenda 21 adopted at the Rio Earth Summit:
I. It is a legally binding treaty on all member states of the United Nations.
II. It is a comprehensive blueprint of action to be taken globally, nationally, and locally.
III. The number 21 in Agenda 21 refers to the 21st century.
Which of the above statements are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

6. How many specific targets are embedded within the 17 Sustainable Development Goals?
(A) 100
(B) 145
(C) 169
(D) 193

7. What is the primary limitation of the traditional concept of economic development?
(A) It focuses exclusively on localized environmental protection.
(B) It prioritizes GDP growth over ecological health.
(C) It emphasizes socio-economic equity metrics for progress.
(D) It restricts modern technological innovation in development.

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The United Nations Conference on Sustainable Development (UNCSD), known as Rio+20, was held in which year?
(A) 2002
(B) 2012
(C) 2015
(D) 2022

9. Which of the following is a key conceptual difference between the MDGs and the SDGs?
(A) MDGs applied to every country, while SDGs focus on the Global South.

68. In India, which institution is responsible for developing and publishing the annual SDG India Index to monitor the progress of States and Union Territories?
(A) Ministry of Environment, Forest and Climate Change
(B) NITI Aayog
(C) Reserve Bank of India
(D) National Development Council

69. What does the term "Localizing SDGs" mean in the context of development policy?
(A) Translating global goals into local policies.
(B) Limiting SDG benefits to local tribal groups.
(C) Rejecting treaties to follow customary laws.
(D) Blocking foreign funds for local projects.

70. SDG 15 (Life on Land) aims to protect, restore, and promote sustainable use of terrestrial ecosystems. Why is Madhya Pradesh's role critical for India's SDG 15 targets?
(A) It possesses the longest coastal boundary among Indian states.
(B) It is composed entirely of arid and semi-arid desert systems.
(C) It holds the largest forest cover area in the country.
(D) It lacks scheduled tribes that depend on forest resources.

71. In Madhya Pradesh, which nodal state department plays a primary role in data collection, compilation, and statistical monitoring of the State Indicator Framework for SDGs?
(A) State Directorate of Economics and Statistics (DES)
(B) Department of Higher Education
(C) State Election Commission
(D) State Police Headquarters

72. Under its climate action commitments (aligning with SDG 13), India has pledged to achieve net-zero carbon emissions by which year?
(A) 2030
(B) 2050
(C) 2070
(D) 2100

73. Read the following statements regarding Madhya Pradesh's performance in the NITI Aayog SDG India Index:
I. Madhya Pradesh has completely achieved all 17 goals and is categorized as an 'Achiever' state.
II. Madhya Pradesh's overall score has shown an improving trend over successive editions of the Index.
III. Madhya Pradesh has made notable progress in goals related to Clean Water and Sanitation and Affordable Energy.
Which of the above statements are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

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74. Which prominent e-governance initiative in Madhya Pradesh directly supports SDG 16 by ensuring responsive, inclusive, and accountable public service delivery and grievance redressal?
(A) Vimarsh Portal
(B) MP Online
(C) CM Helpline 181
(D) Awas Mitra

75. The integration of Baiga and Sahariya traditional knowledge in forest conservation programs in Madhya Pradesh is a prime example of achieving:
(A) SDG 9
(B) SDG 11
(C) SDG 15
(D) SDG 7

76. SDG 12 promotes Responsible Consumption and Production. Which economic model, aiming to eliminate waste and the continual use of resources, is a core strategy for this goal?
(A) Linear Economy
(B) Command Economy
(C) Laissez-faire Economy
(D) Circular Economy

77. Match the Sustainable Development Goals in List I with their focus areas in List II.
List I: SDGs
P. SDG 13
Q. SDG 14
R. SDG 15

environment can sustain indefinitely
3. Designing out waste and pollution while keeping products in use
4. Fairness in resource allocation between present and future populations

(A) P-3, Q-4, R-2, S-1
(B) P-4, Q-1, R-3, S-2
(C) P-4, Q-3, R-1, S-2
(D) P-1, Q-2, R-4, S-3

95. Arrange the following landmark environmental/ developmental milestones in their correct chronological order from earliest to latest:
I. Millennium Summit (Adoption of MDGs)
II. Publication of 'Our Common Future'
III. UN Sustainable Development Summit (Adoption of SDGs)
IV. Rio Earth Summit
Which of the following represents the correct sequence?
(A) II, IV, I, III
(B) IV, II, I, III
(C) II, I, IV, III
(D) I, II, IV, III

96. Which of the following best describes the role of civil society organizations (CSOs) in SDG implementation?
(A) Passing binding legislation in the state assembly.
(B) Advocacy, implementation, and holding power accountable.
(C) Managing the issuance of national currency for funds.
(D) Deploying international military peacekeeping missions.

97. The primary purpose of introducing a gender lens in the budget process (Gender Budgeting) is to:
(A) Link gender goals to fiscal commitments and tracking.
(B) Enforce equal pay standards in the private sector.
(C) Exempt all women from paying annual income taxes.
(D) Provide universal basic income to female citizens.

98. Madhya Pradesh has actively utilized Gender Budgeting to advance which Sustainable Development Goal?
(A) SDG 2
(B) SDG 5
(C) SDG 14
(D) SDG 15

99. The corporate sector in India contributes to the SDGs largely through mandated Corporate Social Responsibility (CSR). Which Act legally mandates CSR for qualifying companies in India?
(A) The Foreign Exchange Management Act, 1999
(B) The Corporate Governance Act, 2015
(C) The Competition Act, 2002
(D) The Companies Act, 2013

100. Which foundational principle of the SDGs emphasizes that the current generation holds the natural environment in trust for future generations?
(A) The Polluter Pays Principle
(B) The Precautionary Principle
(C) The Principle of Common but Differentiated Responsibilities
(D) The Principle of Intergenerational Equity

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Nationally Determined Contributions (NDCs) include achieving specific non-fossil fuel energy capacity targets known as the:
(A) Panchsheel Principles
(B) Panchamrit Strategy
(C) Saptarishi Targets
(D) Navratna Goals

87. Which specific funding mechanism in Madhya Pradesh targets the socio-economic advancement of tribal populations, directly aligning with SDG 1 (No Poverty) and SDG 10 (Reduced Inequalities)?
(A) Urban Infrastructure Development Fund (UIDF)
(B) Special Central Assistance to Tribal Sub-Scheme (SCA to TSS)
(C) Members of Parliament Local Area Development Scheme (MPLADS)
(D) State Disaster Mitigation Fund (SDMF)

88. SDG 15 specifically calls for halting and reversing land degradation and:
(A) Promoting marine fishing
(B) Halting biodiversity loss
(C) Reducing atmospheric carbon dioxide
(D) Increasing urban sprawl

89. Which nodal agency coordinates the preparation and presentation of India's Voluntary National Review (VNR) to the United Nations?
(A) Ministry of External Affairs
(B) NITI Aayog
(C) Prime Minister's Office
(D) Ministry of Statistics and Programme Implementation

90. What is the primary focus of SDG 17?
(A) Strengthening the Global Partnership for SDGs.
(B) Preserving ancient cultural heritage sites.
(C) Exploring and colonizing outer space zones.
(D) Developing autonomous artificial intelligence.

91. Read the following statements regarding Gender Budgeting and Sustainable Development Goals (SDGs) in Madhya Pradesh:
I. Gender budgeting is a separate budget passed exclusively for women.
II. It is a tool to analyze government budgets to establish their gender-differentiated impacts.
III. Madhya Pradesh publishes a separate Gender Budget Statement along with the state budget.
IV. It allocates funds specifically targeting women's empowerment schemes like Ladli Behna.
V. It completely ignores infrastructure spending, focusing only on welfare.
Which of the above statements are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) III, IV, and V only
(D) I, IV, and V only

92. Select the correct order of the performance categories used in the NITI Aayog SDG India Index, arranged from the lowest score range to the highest score range.
(A) Aspirant, Front Runner, Performer, Achiever
(B) Aspirant, Performer, Front Runner, Achiever
(C) Laggard, Aspirant, Performer, Achiever
(D) Performer, Aspirant, Achiever, Front Runner

93. The successful implementation of SDGs requires a "Whole of Society" approach. What does this imply?
(A) Government agencies acting independently of citizens.
(B) NGOs becoming the only source of project funding.
(C) Rejecting modern technology to achieve sustainability.
(D) Collaboration among government, private sector, and citizens.

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94. Match the sustainability concepts in List I with their definitions in List II.
List I: Concepts
P. Intergenerational Equity
Q. Circular Economy
R. Green Economy
S. Carrying Capacity
List II: Definitions
1. Low carbon, resource-efficient, and socially inclusive growth
2. Maximum population size that an

43. (B) SDG 6
Achieving Open Defecation Free status is a critical indicator for Sustainable Development Goal 6, which focuses on clean water and sanitation. This involves ensuring that everyone has access to adequate and equitable sanitation and hygiene. By eliminating open defecation, Madhya Pradesh reduces the spread of waterborne diseases and improves the dignity and safety of its citizens, particularly women and children in rural areas.

44. (D) Ladli Laxmi Yojana
The Ladli Laxmi Yojana in Madhya Pradesh was designed to improve the status of the girl child and ensure her education and health. By providing financial incentives for the birth and upbringing of girls, the scheme directly supports Sustainable Development Goal 5, which aims for gender equality. It helps eliminate discrimination and promotes the empowerment of women from a very early age.

45. (C) Gini Coefficient
The Gini Coefficient is the most widely used statistical measure for assessing income or wealth inequality within a population. It ranges from zero, representing perfect equality, to one, representing perfect inequality. This metric is essential for monitoring progress toward Sustainable Development Goal 10, as it allows policymakers to track whether economic growth is being shared equitably across different income groups.

46. (B) Mukhya Mantri Jan-Kalyan (Sambal) Yojana
The Sambal Yojana is a comprehensive social security scheme in Madhya Pradesh that provides support to unorganized sector workers and their families. It offers assistance for maternity, education, and accidental death, which helps protect vulnerable households from falling into poverty. This initiative directly aligns with Sustainable Development Goal 1 by building resilience and providing a safety net for the economically disadvantaged.

47. (B) NEET
The abbreviation NEET stands for "Not in Education, Employment, or Training." This metric is a key indicator for Sustainable Development Goal 8, as it measures the proportion of youth who are disengaged from both the labor market and educational systems. Reducing this percentage is crucial for ensuring that young people can contribute to economic growth and achieve personal development and financial independence.

48. (C) SDG 3
Ayushman Bharat is India's flagship health protection scheme aimed at providing financial risk protection for hospitalization. By facilitating access to quality healthcare for millions of families, it is a primary driver for achieving Universal Health Coverage. This objective is an explicit target of Sustainable Development Goal 3, which seeks to ensure healthy lives and promote well-being for all individuals regardless of their economic status.

49. (A) Sanchi
Sanchi, a historic town in Madhya Pradesh known for its ancient stupas, has been designated as India's first solar city. This initiative involves meeting the town's energy needs through solar power, thereby reducing carbon emissions. This project serves as a practical example of Sustainable Development Goal 7, demonstrating how clean and affordable energy can be integrated into urban planning and heritage conservation.

50. (C) Ensuring participation and equal leadership opportunities
By providing fifty percent reservation for women in Panchayati Raj Institutions, Madhya Pradesh has taken a significant step toward achieving Sustainable Development Goal 5. This policy ensures that women have an equal voice in local governance and leadership roles. Promoting female representation in political decision-making is essential for empowering women and ensuring that policies reflect the needs and perspectives of the entire community.

51. (D) AMRUT and Smart Cities Mission
The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and the Smart Cities Mission are key programs driving progress toward Sustainable Development Goal 11 in Madhya Pradesh. These initiatives focus on improving urban infrastructure, including water supply, sewerage, and sustainable transport. By creating more resilient and efficient urban environments,

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ANSWERS

1. (D) Our Common Future
The Brundtland Commission, officially the World Commission on Environment and Development, released this landmark report in 1987. It introduced the most widely recognized definition of sustainable development. The document addressed the conflict between global industrialization and ecological health, urging nations to adopt growth models that preserve the planet for future generations while meeting current needs.

2. (A) Both A and R are true and R is the correct explanation of A
The Millennium Development Goals were criticized for being non-universal because they focused primarily on reducing poverty in developing nations. Unlike the Sustainable Development Goals, which apply to all countries, the older framework viewed developed nations as providers of aid rather than active participants. This donor-recipient dynamic limited global accountability and failed to address universal challenges.

3. (C) Progress meeting current needs without harming future capacity
Sustainable development represents a balanced approach to progress that ensures economic growth does not deplete natural resources. It emphasizes meeting the requirements of the present population while safeguarding the ability of future generations to satisfy their own needs. This definition requires integrating environmental protection, social equity, and economic stability into long-term policy planning and resource management.

4. (C) September 2015
Member states of the United Nations officially adopted the 2030 Agenda for Sustainable Development during a historic summit in New York. This event occurred in September 2015, marking the transition from the Millennium Development Goals. The adoption established seventeen global goals designed to address poverty, inequality, and climate change through a comprehensive framework for international cooperation.

5. (B) II and III only
Agenda 21 serves as a comprehensive non-binding action plan for sustainable development at global, national, and local levels. Adopted during the 1992 Rio Earth Summit, the number twenty-one signifies the plan's focus on challenges facing the twenty-first century. It is not a legally binding treaty but provides a blueprint for governments to implement environmental and developmental programs.

6. (C) 169
The 2030 Agenda for Sustainable Development comprises seventeen broad goals supported by a detailed framework of specific targets. These targets provide measurable benchmarks to track progress across diverse socio-economic and environmental sectors. By including exactly one hundred and sixty-nine targets, the framework ensures that the high-level goals are translated into actionable and quantifiable policy objectives worldwide.

(B) It prioritizes GDP growth over ecological health
Traditional economic development models often rely heavily on Gross Domestic Product as the primary indicator of success. This narrow focus frequently ignores the depletion of natural capital and the degradation of ecosystems. By prioritizing short-term financial gains and industrial output over environmental sustainability, these older models fail to account for the long-term costs of resource exhaustion and pollution.

8. (B) 2012
The United Nations Conference on Sustainable Development took place in Rio de Janeiro twenty years after the original Earth Summit. Held in 2012, this landmark gathering focused on two main themes: the green economy in the context of poverty eradication and the institutional framework for sustainable development. It

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resulted in the outcome document titled The Future We Want.

9. (B) SDGs apply to all nations, whereas MDGs focused on the Global South
A fundamental shift in global development policy occurred with the introduction of the Sustainable Development Goals. While the Millennium Development Goals were primarily designed as a framework for developing nations to reduce extreme poverty, the seventeen newer goals are universal. This means both rich and poor countries are now responsible for achieving targets related to sustainability and equity.

10. (C) Military Superiority
The framework for sustainable development is built upon three foundational pillars that must be balanced to achieve long-term progress. These pillars include economic growth, social inclusion, and environmental stewardship. Concepts like military power or strategic dominance are not recognized components of this paradigm. Instead, the focus remains on ensuring prosperity, equity, and the preservation of natural ecosystems.

11. (D) Leave No One Behind
The central transformative promise of the 2030 Agenda for Sustainable Development is to ensure that progress reaches every individual. This commitment focuses on reaching the most vulnerable populations and reducing inequalities within and between countries. By prioritizing the needs of marginalized groups, the global community aims to build a more equitable society where benefits of development are shared.

12. (C) P-3, Q-4, R-1, S-2
Global environmental milestones have occurred over several decades to shape modern sustainability policy. The Brundtland Report was published in 1987, followed by the Rio Earth Summit in 1992. Later, the World Summit on Sustainable Development took place in Johannesburg in 2002. Finally, the Rio+20 Summit was held in 2012, continuing the international dialogue on green economies and development.

13. (A) Promote growth while reducing environmental and social risks
The concept of a green economy focuses on generating economic value while significantly reducing environmental impacts and ecological scarcities. It seeks to decouple economic growth from resource depletion and carbon emissions. By integrating social equity and environmental health into financial planning, this model aims to foster sustainable prosperity that protects natural assets and improves human well-being for everyone.

14. (C) To outline an action plan for sustainability in the 21st century
Agenda 21 was established as a comprehensive blueprint for action to be taken globally, nationally, and locally by organizations of the United Nations system. Created at the Rio Earth Summit, it addresses the environmental and developmental challenges of the new millennium. The document provides guidelines for sustainable land use, biodiversity conservation, and poverty reduction to ensure a balanced future.

15. (D) Brundtland Report, Earth Summit (Rio), Adoption of MDGs, Adoption of SDGs
Development milestones began with the Brundtland Report in 1987, which defined sustainable development. This was followed by the 1992 Rio Earth Summit. At the turn of the millennium in 2000, the Millennium Development Goals were established. Finally, the Sustainable Development Goals were adopted in 2015 to build upon previous achievements and address new global challenges through 2030.

16. (A) It inherently prioritized the long-term regeneration of natural resources
Traditional development models are typically characterized by an emphasis on industrialization and rapid economic expansion using finite resources. These approaches often treated natural capital as an inexhaustible supply of raw materials and rarely considered the regenerative capacity of ecosystems. Prioritizing long-term resource sustainability is a core feature of sustainable development, rather than the older traditional economic growth paradigms.

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17. (A) Transforming our world: the 2030 Agenda for Sustainable Development
The United Nations General Assembly adopted the seventeen Sustainable Development Goals under a comprehensive resolution focused on global transformation. This agenda serves as a plan of action for people, planet, and prosperity. It seeks to strengthen universal peace and eradicate poverty in all forms. The resolution outlines a collective commitment to achieve sustainable progress across social, economic, and environmental dimensions.

18. (A) Economic viability, Social equity, and Environmental protection
Sustainable development is conceptually structured around three interdependent pillars that must function together. Economic viability ensures that growth is maintained without exhausting resources. Social equity focuses on fairness, justice, and the well-being of all citizens. Environmental protection emphasizes the conservation of biodiversity and ecosystems. Balancing these three areas is essential for achieving a stable and prosperous future for humanity.

19. (A) 8
The Millennium Development Goals were a set of eight time-bound objectives established in 2000 to tackle global poverty. These goals included targets for reducing extreme hunger, achieving universal primary education, and promoting gender equality. While they laid the groundwork for international development cooperation, they were eventually succeeded by the broader and more comprehensive seventeen Sustainable Development Goals in 2015.

20. (A) Water, Energy, Health, Agriculture, Biodiversity
During the 2002 World Summit on Sustainable Development in Johannesburg, the Secretary-General proposed the WEHAB framework to focus international efforts. This acronym represents five key thematic areas: water and sanitation, energy, health, agriculture, and biodiversity. These sectors were identified as critical priorities for achieving sustainable development and improving the lives of people, particularly in the most vulnerable developing regions.

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21. (C) The principle of interconnectedness and indivisibility
The Sustainable Development Goals are designed to be integrated and indivisible, meaning that progress in one area often depends on or affects progress in others. For example, improvements in health are linked to clean water and quality education. This principle recognizes that complex global challenges cannot be solved in isolation and requires a holistic approach to policy and implementation.

22. (B) World Commission on Environment and Development (WCED)
Established by the United Nations in 1983, the World Commission on Environment and Development was tasked with re-evaluating global environmental issues and developmental challenges. Led by Gro Harlem Brundtland, the commission's work culminated in the influential report titled Our Common Future. This group played a pivotal role in shifting the international focus toward a more integrated model of sustainable progress.

23. (D) Rio de Janeiro
The 1992 United Nations Conference on Environment and Development, commonly referred to as the Earth Summit, was hosted in Rio de Janeiro, Brazil. This historic gathering resulted in several landmark agreements, including Agenda 21 and the Rio Declaration. It marked a significant moment in global diplomacy where nations acknowledged the urgent need to integrate environmental protection with socio-economic development policies.

24. (D) The need to integrate ecological, economic, and social dimensions
While the Millennium Development Goals focused primarily on social issues and poverty in developing countries, the transition to Sustainable Development Goals was driven by a need for a more holistic framework. The newer goals incorporate environmental sustainability alongside economic and social progress. This comprehensive approach recognizes that long-term human well-being is impossible without protecting the planet's ecosystems and natural resources.

25. (B) The Future We Want
The 2012 United Nations Conference on Sustainable Development concluded with the adoption of a political outcome document. This document reaffirmed the international community's commitment to sustainable development and poverty eradication. It laid the groundwork for the development of the Sustainable Development Goals by identifying key thematic areas and emphasizing the importance of a green economy and institutional reform for global progress.

26. (D) Balancing growth, social inclusion, and environmental health
The fundamental goal of sustainable development is to create a harmonious relationship between human progress and the natural world. This requires a balanced approach where economic expansion does not come at the expense of social equity or ecological integrity. By integrating these three dimensions, the objective is to ensure that current development does not compromise the well-being of future generations.

27. (B) 1st January 2016
Following their formal adoption by the United Nations General Assembly in September 2015, the seventeen Sustainable Development Goals officially came into effect at the start of the next year. This date marked the beginning of a fifteen-year period during which countries are expected to mobilize efforts to end poverty, fight inequalities, and address climate change by the year 2030.

28. (A) Economic, Social, and Environmental
Stopping a mining project to protect tribal livelihoods and biodiversity demonstrates the complex trade-offs involved in sustainable development. The decision balances economic potential from mining against the social needs of indigenous communities and the environmental necessity of preserving ecosystems. This integrated thinking is a hallmark of sustainability, ensuring that industrial activities do not cause irreparable harm to people or nature.

29. (C) 2015
When the Millennium Development Goals were established in 2000, world leaders set a fifteen-year deadline for achieving the specific targets. This period concluded in 2015, at which point the global community assessed the progress made in areas like poverty reduction and maternal health. The completion of this cycle led directly to the formulation and adoption of the 2030 Agenda.

30. (D) Rio+10
The World Summit on Sustainable Development was held in 2002 to review the progress made since the 1992 Earth Summit. Because it took place exactly one decade after the Rio conference, it is frequently referred to as Rio+10. The summit aimed to revitalize the global commitment to sustainable development and resulted in the Johannesburg Declaration and a plan of implementation.

31. (C) 70 per 100,000 live births
Sustainable Development Goal 3 focuses on ensuring healthy lives and promoting well-being for all ages. One of its key global targets is to reduce the maternal mortality ratio significantly. The specific objective is to bring the global average down to less than seventy deaths per one hundred thousand live births by the year 2030 through improved healthcare access and quality.

32. (B) I, III, IV, and V only
Madhya Pradesh has taken significant steps to align with Sustainable Development Goal 7 by promoting renewable energy. Key initiatives include the Rewa Ultra Mega Solar project, floating solar plants at Omkareshwar, and the development of Sanchi as India's first solar city. These efforts demonstrate a shift away from coal-dependency toward affordable and clean energy sources for the state's residents.

33. (B) $1.90 (updated line often referenced as $2.15)
Sustainable Development Goal 1 aims to eradicate extreme poverty for all people everywhere. The international poverty line, which measures the minimum income required for basic needs, was traditionally set at one dollar and ninety cents per day. Although periodically updated for inflation by the World Bank, this threshold remains a critical benchmark for tracking global progress in lifting the most vulnerable populations out of poverty.

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34. (D) Universal Basic Income
Sustainable Development Goal 9 focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. These three pillars are essential for driving economic growth and creating jobs. While universal basic income is a social policy discussed in the context of poverty and inequality, it is not one of the primary components explicitly embedded in the core framework of goal nine.

35. (A) P-4, Q-3, R-2, S-1
The Sustainable Development Goals are numbered to address specific global challenges in a systematic way. Goal 1 is dedicated to ending poverty in all its forms. Goal 2 focuses on ending hunger and improving nutrition. Goal 3 aims to ensure good health and well-being for all. Goal 4 addresses the need for inclusive and equitable quality education and lifelong learning.

36. (B) SDG 10
The Pradhan Mantri Jan Dhan Yojana is a national mission for financial inclusion in India. By providing universal access to banking services, it helps reduce the gap between different socio-economic groups. This initiative directly supports Sustainable Development Goal 10, which aims to reduce inequalities within and among countries by ensuring that even the poorest citizens have access to financial tools for development.

37. (A) End poverty in all its forms everywhere
The primary objective of Sustainable Development Goal 1 is to eliminate poverty in all its dimensions by 2030. This includes not only raising income levels above the international poverty line but also addressing social exclusion and lack of access to basic services. It emphasizes building resilience among the poor to protect them from economic shocks and environmental disasters.

38. (A) 2024
India's Jal Jeevan Mission is designed to ensure that every rural household has access to safe and adequate drinking water through individual tap connections. This ambitious project aligns with Sustainable Development Goal 6, which targets clean water and sanitation. The government has set a target year of 2024 to achieve this milestone, improving health and reducing the burden of water collection.

39. (D) Decent Work and Economic Growth
Sustainable Development Goal 8 promotes sustained, inclusive, and sustainable economic growth alongside full and productive employment. It emphasizes the creation of decent work for all, which involves fair wages, workplace safety, and social protection. This goal recognizes that economic expansion must be accompanied by improved labor rights and opportunities for youth to ensure that development benefits the entire workforce.

40. (D) Sickle Cell Anemia
Madhya Pradesh has launched specialized screening and management programs to address Sickle Cell Anemia, a genetic blood disorder particularly prevalent among its tribal communities. This initiative aligns with Sustainable Development Goal 3 by targeting a specific health challenge that disproportionately affects marginalized groups. Improving diagnosis and treatment for this condition is crucial for enhancing the overall well-being and health outcomes of the state's population.

41. (B) SDG 11
Indore's success in waste management and cleanliness reflects the targets of Sustainable Development Goal 11, which focuses on sustainable cities and communities. This goal aims to reduce the adverse per capita environmental impact of cities, including through paying special attention to air quality and municipal waste management. Indore's model demonstrates how urban areas can achieve sustainability through effective policy and public participation.

42. (C) Stunting and wasting
A key target under Sustainable Development Goal 2 is to end all forms of malnutrition. This includes meeting internationally agreed targets on stunting and wasting in children under five years of age. Stunting refers to impaired growth due to chronic malnutrition, while wasting is a sign of acute nutritional deficiency. Addressing these issues is vital for ensuring the physical and cognitive development of future generations.

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S. SDG 16

List II: Focus Areas

1. Life Below Water
2. Life on Land
3. Climate Action
4. Peace, Justice, and Strong Institutions

(A) P-1, Q-2, R-3, S-4
(B) P-4, Q-3, R-1, S-2
(C) P-3, Q-2, R-1, S-4
(D) P-3, Q-1, R-2, S-4

78. Which of the following is a key global target under SDG 14?
(A) Halting deforestation activities.
(B) Promoting solar energy adoption.
(C) Reducing indoor air pollutants.
(D) Addressing ocean acidification.

79. Voluntary National Reviews (VNRs) are part of the follow-up and review mechanism for the 2030 Agenda. At which global forum do countries present their VNRs?
(A) UN Security Council (UNSC)
(B) High-Level Political Forum on Sustainable Development (HLPF)
(C) International Court of Justice (ICJ)
(D) World Economic Forum (WEF)

80. North-South, South-South, and triangular regional and international cooperation on science, technology, and innovation are key targets of which goal?
(A) SDG 7
(B) SDG 9
(C) SDG 16
(D) SDG 17

81. Read the following statements regarding the SDG monitoring framework in India:
I. The National Indicator Framework (NIF) is the backbone for monitoring SDGs at the national level.
II. States are encouraged to develop a State Indicator Framework (SIF) aligned with the NIF but suited to local context.
III. District-level monitoring is completely prohibited under NITI Aayog guidelines.
IV. The SIF helps in standardizing data collection across different departments within the state.

Which of the above statements are correct?
(A) II, III, and IV only
(B) I, III, and IV only
(C) I, II, and IV only
(D) I and II only

82. To localize SDG 13, Madhya Pradesh has formulated the SAPCC. What does SAPCC stand for?
(A) State Action Plan on Climate Change
(B) Strategic Assessment of Pollution and Climate Change
(C) State Agency for Pollution and Carbon Control
(D) Sustainable Action Program for Climate Communities

83. Given below are two statements, one is labelled as Assertion (A) and the other as Reason (R):
Assertion (A): Madhya Pradesh plays a pivotal role in India's progress towards SDG 15 (Life on Land).
Reason (R): Madhya Pradesh accounts for the largest geographical area under forest cover in the country, harboring immense biodiversity.
Select the correct answer:
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

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84. Which constitutional bodies play the most crucial role in localizing SDGs at the grassroots level in rural Madhya Pradesh?
(A) State Public Service Commissions
(B) Municipal Corporations
(C) Panchayati Raj Institutions (PRIs)
(D) State Finance Commissions

85. The NITI Aayog SDG India Index classifies States into four categories based on their score. Which of the following is NOT one of these categories?
(A) Aspirant
(B) Performer
(C) Laggard
(D) Front Runner

86. SDG 13 mandates urgent action to combat climate change and its impacts. India's

these missions enhance the quality of life for residents in cities like Indore and Bhopal.

52. (B) SDG 2
The Mukhya Mantri Bal Arogya Samvardhan Program in Madhya Pradesh is specifically designed to identify and treat malnutrition among children. By providing specialized nutritional support and medical care, the program directly addresses the targets of Sustainable Development Goal 2. Reducing childhood stunting and wasting is critical for building a healthy future population and achieving the global goal of ending hunger and malnutrition.

53. (C) CM Rise Schools
The CM Rise School initiative in Madhya Pradesh aims to provide high-quality education by developing integrated schools with modern infrastructure and skilled teachers. This program aligns with Sustainable Development Goal 4 by focusing on inclusive and equitable quality education. These schools are designed to bridge the gap between rural and urban educational standards, ensuring that all students have access to excellent learning opportunities.

54. (C) Micro, Small and Medium Enterprises
MSME stands for Micro, Small and Medium Enterprises. These businesses are vital for driving economic growth and providing employment, particularly in a developing economy. In Madhya Pradesh, the promotion of this sector aligns with Sustainable Development Goal 8, which emphasizes decent work and sustainable growth. Supporting MSMEs helps diversify the economy, foster innovation, and create opportunities for local entrepreneurs and laborers.

55. (A) Burhanpur
Burhanpur district in Madhya Pradesh made history by becoming the first district in India to be certified as "Har Ghar Jal," meaning every household has access to safe tap water. This achievement is a major milestone for Sustainable Development Goal 6 and the national Jal Jeevan Mission. It demonstrates the successful implementation of large-scale infrastructure projects to provide basic amenities to rural and urban populations alike.

56. (A) III only
Sustainable Development Goal 2 aims to end hunger and promote sustainable agriculture. In Madhya Pradesh, the Public Distribution System (PDS) plays a crucial role in providing food security to vulnerable populations, making statement III incorrect. Additionally, the state promotes millets and organic farming to enhance nutrition and sustainability, which are core components of the global goal to ensure food access and environmental health.

57. (A) III, I, II, IV
Localizing Sustainable Development Goals typically begins with sensitizing and building the capacity of local officials. Once aware, the next step involves mapping existing state schemes to specific global targets. This is followed by setting district-level baselines and indicator targets to measure progress. Finally, regular monitoring through planning committees ensures that implementation stays on track and achieves the desired socio-economic and environmental outcomes.

58. (A) Promoting lifelong learning opportunities for all
Sustainable Development Goal 4 is not limited to primary or secondary schooling; it encompasses the entire spectrum of education. A critical additional component is the promotion of lifelong learning opportunities for all people. This includes vocational training, adult education, and skills development that allow individuals to adapt to changing economic conditions and continue their personal and professional growth throughout their lives.

59. (C) Sub-bituminous Coal
Clean and renewable energy sources are those that are naturally replenished and have a lower environmental impact than fossil fuels. Solar, wind, and small hydro power are recognized under Sustainable Development Goal 7 as sustainable options. Sub-bituminous coal is a fossil fuel that releases significant greenhouse gases when burned, making it a major contributor to climate change and contrary to renewable energy targets.

60. (B) Shared responsibility within the household
Sustainable Development Goal 5 includes a target to recognize and value unpaid care and domestic

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urgent climate action. Goal 14 addresses the conservation of life below water, specifically oceans and marine life. Goal 15 focuses on life on land, including forests and biodiversity. Goal 16 promotes peace, justice, and the development of strong, accountable institutions across the globe.

78. (D) Addressing ocean acidification
A critical target under Sustainable Development Goal 14 is to minimize and address the impacts of ocean acidification. This phenomenon, caused by the absorption of excess carbon dioxide from the atmosphere, threatens marine ecosystems and the livelihoods of people who depend on them. International efforts to reduce carbon emissions and protect marine biodiversity are essential for maintaining the health of the world's oceans and coastal regions.

79. (B) High-Level Political Forum on Sustainable Development (HLPF)
The High-Level Political Forum on Sustainable Development is the main United Nations platform for the follow-up and review of the 2030 Agenda. During its annual meetings, countries present their Voluntary National Reviews, which detail the progress they have made and the challenges they face in achieving the goals. This peer-review process encourages transparency, knowledge sharing, and international cooperation for sustainable development.

80. (D) SDG 17
Sustainable Development Goal 17 focuses on strengthening the global partnership for sustainable development. A key target of this goal is to enhance North-South, South-South, and triangular cooperation on science, technology, and innovation. This involves sharing knowledge and resources to help developing nations build the capacity needed to achieve the other sixteen goals. Collaboration between different regions and sectors is essential for global progress.

81. (C) I, II, and IV only
India's SDG monitoring framework relies on the National Indicator Framework and encourages states to develop their own localized versions. These frameworks help standardize data collection and ensure that progress is measured accurately at both national and state levels. District-level monitoring is not only allowed but encouraged by NITI Aayog to ensure that the goals are being met at the grassroots level throughout the country.

82. (A) State Action Plan on Climate Change
The State Action Plan on Climate Change is a strategic document formulated by Madhya Pradesh to address the challenges of global warming at the local level. It outlines specific measures for adaptation and mitigation across various sectors like agriculture, water resources, and energy. By localizing climate action through this plan, the state aligns with Sustainable Development Goal 13 and contributes to national environmental targets.

83. (A) Both A and R are true and R is the correct explanation of A
Madhya Pradesh is undeniably a key player in India's efforts toward Sustainable Development Goal 15 because of its vast forest resources. The state's large geographical area under forest cover provides critical habitats for diverse flora and fauna. Effective management and conservation of these forests in Madhya Pradesh are essential for maintaining national biodiversity and achieving the broader global targets for terrestrial ecosystem preservation.

84. (C) Panchayati Raj Institutions (PRIs)
Panchayati Raj Institutions are the backbone of local governance in rural India and play a crucial role in localizing Sustainable Development Goals. These bodies are responsible for implementing various developmental schemes related to health, education, and sanitation at the village level. By empowering these institutions, the state ensures that sustainability efforts are grounded in local needs and that citizens are active participants in their own development.

85. (C) Laggard
The NITI Aayog SDG India Index classifies states into four specific categories based on their composite scores: Aspirant (0-49), Performer (50-64), Front Runner (65-99), and Achiever (100). The term "Laggard" is not used in this official classification system. This categorization helps motivate states to improve their performance and provides a clear framework for identifying which regions need the most support to reach their targets.

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69. (A) Translating global goals into local policies
Localizing Sustainable Development Goals refers to the process of adapting global targets to suit the specific context and needs of local communities. It involves integrating these goals into local development plans and ensuring that local governments have the resources and authority to implement them. This approach recognizes that the success of the 2030 Agenda depends on action taken at the grassroots level by local authorities and citizens.

70. (C) It holds the largest forest cover area in the country
Madhya Pradesh plays a vital role in achieving Sustainable Development Goal 15 because it has the largest area of forest cover in India. These forests are essential for biodiversity conservation, carbon sequestration, and supporting the livelihoods of millions of people. Protecting and managing these terrestrial ecosystems is a national priority that contributes significantly to global efforts to halt land degradation and biodiversity loss.

71. (A) State Directorate of Economics and Statistics (DES)
In Madhya Pradesh, the State Directorate of Economics and Statistics is the primary department responsible for data collection and statistical monitoring of the State Indicator Framework. This department compiles data from various government agencies to track progress toward the Sustainable Development Goals. Accurate and timely data are essential for informed decision-making and for evaluating the impact of state-level policies on social and environmental outcomes.

72. (C) 2070
As part of its commitment to Sustainable Development Goal 13 and global climate action, India has pledged to achieve net-zero carbon emissions by the year 2070. This target was announced at the COP26 summit and represents a long-term strategy to transition the economy toward renewable energy and low-carbon technologies. Achieving this goal requires massive shifts in energy production, industrial processes, and transportation across the country.

73. (B) II and III only
While Madhya Pradesh has not yet achieved all seventeen goals, its overall score in the NITI Aayog SDG India Index has shown a steady upward trend. The state has made significant progress in areas like clean water, sanitation, and affordable energy. These improvements reflect the success of various state and national missions aimed at enhancing basic infrastructure and quality of life for the population.

74. (C) CM Helpline 181
The CM Helpline 181 in Madhya Pradesh is an e-governance initiative that provides a platform for citizens to register grievances and seek information about public services. This system promotes accountability and transparency in government, which are key objectives of Sustainable Development Goal 16. By ensuring that public concerns are addressed promptly, the helpline strengthens the relationship between the state and its citizens and improves governance.

75. (C) SDG 15
Integrating the traditional knowledge of tribal communities like the Baiga and Sahariya into forest conservation is a prime example of Sustainable Development Goal 15 in action. This approach recognizes that indigenous populations have deep insights into managing terrestrial ecosystems sustainably. By partnering with these communities, the state can better protect biodiversity and restore degraded land while respecting the cultural heritage and rights of forest-dwelling people.

76. (D) Circular Economy
The circular economy is a model of production and consumption that involves sharing, leasing, reusing, and recycling existing materials and products for as long as possible. This approach aims to minimize waste and reduce the demand for new resources. It is a core strategy for achieving Sustainable Development Goal 12, as it promotes responsible production and helps decouple economic growth from environmental degradation.

77. (D) P-3, Q-1, R-2, S-4
The final set of Sustainable Development Goals focuses on environmental protection and institutional strength. Goal 13 calls for

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26. Consider the following statements regarding the environment:
Statement I: The biotic components include all living organisms such as plants, animals, and microbes.
Statement II: The abiotic components consist only of physical factors like temperature and light, completely excluding chemical factors like soil nutrients.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct and Statement II is incorrect
(D) Statement I is incorrect and Statement II is correct

27. Match the biogeochemical cycles in List I with their primary reservoirs in List II.
List I: (Biogeochemical Cycle)
P. Carbon Cycle
Q. Nitrogen Cycle
R. Phosphorus Cycle
S. Water Cycle
List II: (Primary Reservoir)
1. Hydrosphere
2. Sedimentary rock
3. Atmosphere
4. Oceans and fossil fuels
Select the correct code:
(A) P-2, Q-3, R-4, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-3, R-2, S-1
(D) P-4, Q-1, R-3, S-2

28. If an aquarium is regularly cleaned, supplied with fish food, and maintained with an aerator, what type of ecosystem does it primarily represent?
(A) Artificial aquatic ecosystem
(B) Natural aquatic ecosystem
(C) Natural terrestrial ecosystem
(D) Climax ecosystem

29. Consider the following statements regarding ecological energy flow:
I. Energy flow in an ecosystem is strictly unidirectional.
II. The ten percent law of energy transfer was proposed by Raymond Lindeman.
III. Available energy increases progressively at each higher trophic level.
IV. Autotrophs form the foundational trophic level for energy transfer.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

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30. Identify the correct statement regarding aquatic ecosystems.
(A) Freshwater ecosystems have a salt concentration consistently above 35 parts per thousand
(B) Marine ecosystems are completely devoid of photosynthetic primary producers
(C) Lotic freshwater ecosystems refer exclusively to standing water bodies like ponds
(D) Estuaries are transitional zones where freshwater rivers meet the saline ocean

31. Which of the following is a negatively framed statement that accurately describes ecological limits?
(A) No species is affected by density-dependent factors like disease
(B) No population growth is ever restricted by predation
(C) No ecosystem has an infinite supply of space and nutrients
(D) No environment imposes a limit on the carrying capacity

32. Which of the following acts as a glaring exception to the characteristics of the Indo-Burma biodiversity hotspot?
(A) It includes parts of northeastern India
(B) It is totally devoid of endemic freshwater turtle species
(C) It is facing severe threats from habitat destruction and poaching
(D) It spans across multiple international borders

33. Identify the factual statement regarding primary succession.
(A) It typically follows events like forest fires or agricultural abandonment
(B) It takes hundreds or thousands of years to

86. (B) Panchamrit Strategy
India's Panchamrit strategy is a set of five ambitious climate commitments announced to help the country reach its sustainability goals. These include increasing non-fossil fuel energy capacity, meeting fifty percent of energy requirements from renewables, and reducing total projected carbon emissions. This strategy is a primary driver for achieving Sustainable Development Goal 13 and demonstrates India's leadership in the global fight against climate change.

87. (B) Special Central Assistance to Tribal Sub-Scheme (SCA to TSS)
The Special Central Assistance to Tribal Sub-Scheme is a dedicated funding mechanism aimed at the socio-economic development of Scheduled Tribes. In Madhya Pradesh, this funding is used to improve infrastructure, healthcare, and livelihoods in tribal-dominated areas. These efforts directly support Sustainable Development Goal 1 and Goal 10 by reducing poverty and inequality among one of the state's most vulnerable and marginalized populations.

88. (B) Halting biodiversity loss
Sustainable Development Goal 15 is focused on the sustainable management of forests, combating desertification, and halting and reversing land degradation. A primary and explicit target of this goal is to halt the loss of biodiversity. This involves protecting endangered species and their habitats, preventing the introduction of invasive species, and ensuring that ecosystems continue to provide the essential services that human society depends on for survival.

89. (A) Strengthening the Global Partnership for SDGs
Sustainable Development Goal 17 serves as the means of implementation for the entire 2030 Agenda. Its primary focus is to strengthen the global partnership for sustainable development by mobilizing resources, enhancing international cooperation, and supporting capacity building. This goal recognizes that the other sixteen goals can only be achieved if countries work together and if the private sector and civil society are actively involved.

90. (B) NITI Aayog
NITI Aayog is the lead agency responsible for coordinating the preparation and presentation of India's Voluntary National Review to the United Nations. This process involves gathering data and insights from various ministries, state governments, and civil society organizations. The VNR provides a comprehensive overview of India's progress toward the Sustainable Development Goals and highlights the country's unique challenges and innovative solutions for sustainable progress.

91. (B) II, III, and IV only
Gender budgeting is not a separate budget exclusively for women, but rather a tool to analyze the gender-differentiated impacts of regular government spending. Madhya Pradesh is a pioneer in this area, publishing a separate Gender Budget Statement that tracks funds allocated for women's empowerment. This process helps ensure that public resources are used effectively to address gender inequalities and support the targets of Sustainable Development Goal 5.

92. (B) Aspirant, Performer, Front Runner, Achiever
The performance categories in the NITI Aayog SDG India Index are arranged based on score ranges. Aspirants have the lowest scores, followed by Performers and then Front Runners. Achievers are those that have reached a perfect score of one hundred across the goals. This hierarchy provides a clear pathway for states to track their progress and aim for higher levels of sustainability and socio-economic development over time.

93. (D) Collaboration among government, private sector, and citizens
A "Whole of Society" approach to the Sustainable Development Goals means that achieving these ambitious targets is not the responsibility of the government alone. It requires the active collaboration and participation of the private sector, civil society organizations, and individual citizens. By leveraging the unique strengths and resources of all these groups, the global community can more effectively address complex challenges and ensure that development is truly sustainable.

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Eagle
(C) Grasshopper → Grass → Snake → Frog → Eagle
(D) Eagle → Snake → Frog → Grasshopper → Grass

9. According to the ten percent law of energy transfer, if 10,000 Joules of solar energy is captured by plants, approximately how much energy is transferred to the secondary consumers?
(A) 1000 Joules
(B) 100 Joules
(C) 10 Joules
(D) 1 Joule

10. Which of the following is an exception to the category of natural terrestrial ecosystems?
(A) Tropical rainforest
(B) Temperate grassland
(C) Botanical garden
(D) Hot desert

11. If all decomposer organisms in a forest ecosystem were completely removed, what would be the most significant immediate consequence for biogeochemical cycles?
(A) The global carbon cycle would accelerate at a very rapid pace
(B) Living plants would immediately double their total photosynthetic output
(C) Water vapor levels in the local atmosphere would decrease substantially
(D) Nutrient cycling would stop, leaving dead organic matter to accumulate

12. Find the odd one out among the following environmental factors.
(A) Sunlight
(B) Topography
(C) Fungi
(D) Precipitation

13. How does a food web differ fundamentally from a food chain?
(A) A food web represents multiple interconnected food chains within an ecosystem
(B) A food web only includes primary producers and primary consumers
(C) A food web consists of a single linear pathway of energy flow
(D) A food web completely ignores the role of decomposers in energy transfer

14. Wetlands are often referred to as the "kidneys of the landscape." This is primarily a cause-and-effect relationship based on which of the following functions?
(A) They generate massive amounts of greenhouse gases that warm the atmosphere
(B) They are the primary source of all freshwater on the planet
(C) They filter out pollutants and purify water before it reaches rivers and lakes
(D) They prevent the natural flow of all local streams

15. The carbon cycle is primarily driven by which two fundamental biological processes?
(A) Transpiration and atmospheric evaporation
(B) Nitrogen fixation and soil denitrification
(C) Mechanical weathering and surface erosion
(D) Photosynthesis and aerobic respiration

16. Match the components of the Earth's environment in List I with their descriptions in List II.
List I: (Environment Component)
P. Lithosphere
Q. Hydrosphere
R. Atmosphere
S. Biosphere
List II: (Description)
1. The gaseous envelope surrounding the Earth
2. The narrow zone of interaction where life exists
3. The solid outer crust and upper mantle of the Earth
4. All the water bodies present on the Earth's surface
Select the correct code:
(A) P-2, Q-3, R-4, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-1, R-2, S-3
(D) P-1, Q-2, R-3, S-4

17. A sharp decline in the population of primary producers in an ecosystem will most likely have which immediate cause-and-effect outcome?
(A) A rapid decline in primary consumer

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CHAPTER 10

Environmental Factors, Biodiversity and Ecosystem

1. Which of the following is the most appropriate reason why the biosphere is considered an open system?
(A) It receives continuous energy from the sun but remains unable to cycle matter within its boundaries
(B) It remains completely isolated from the geological lithosphere and the liquid hydrosphere
(C) It does not require any form of external energy input to maintain and sustain biological life
(D) It receives solar energy from the sun and exchanges energy and matter with its surroundings

2. Find the odd one out among the following ecosystem types based on their fundamental classification.
(A) Taiga
(B) Tundra
(C) Coral Reef
(D) Tropical Rainforest

3. Which of the following is strictly an abiotic component of the environment?
(A) Decomposers
(B) Primary producers
(C) Soil moisture
(D) Herbivores

4. Which of the following biogeochemical cycles is an exception to the purely gaseous cycles?
(A) Carbon cycle
(B) Nitrogen cycle
(C) Phosphorus cycle
(D) Oxygen cycle

5. Grassland ecosystems are primarily characterized by the dominance of grasses rather than large trees. Which environmental factor largely prevents the widespread establishment of trees in natural grasslands?
(A) Excessive and heavy annual rainfall occurring throughout the year
(B) Recurring fires and periodic seasonal drought conditions
(C) Presence of highly acidic topsoil that inhibits deep root growth
(D) Permanent presence of permafrost beneath the soil surface

6. Biological nitrogen fixation is critical for ecosystem functioning because most living organisms cannot utilize atmospheric nitrogen directly. Which of the following best identifies the major natural agents of this process?
(A) Photosynthetic green plants and algae
(B) Diverse bacteria and cyanobacteria
(C) Decomposing fungi and soil protozoans
(D) Infectious viruses and protein prions

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7. Which of the following best defines an ecosystem according to fundamental ecological principles?
(A) A geographical area defined by the total absence of all essential abiotic elements and resources
(B) A unit where living organisms interact with each other and their physical environment
(C) An isolated community of terrestrial plants surviving without any direct interaction with animal species
(D) A highly controlled artificial environment constructed exclusively to maximize commercial agricultural productivity

8. Which of the following represents the correct sequence of energy flow in a terrestrial grazing food chain?
(A) Grass → Frog → Grasshopper → Snake → Eagle
(B) Grass → Grasshopper → Frog → Snake →

94. (C) P-4, Q-3, R-1, S-2
Key sustainability concepts provide the theoretical foundation for global policy. Intergenerational equity focuses on fairness between present and future populations. The circular economy aims to design out waste and keep products in use. The green economy promotes low-carbon and socially inclusive growth. Carrying capacity refers to the maximum population an environment can sustain indefinitely. Together, these principles guide the transition toward a sustainable world.

95. (A) II, IV, I, III
The timeline of global sustainability milestones began with the publication of the Brundtland Report in 1987. This was followed by the Rio Earth Summit in 1992, which set the stage for international environmental law. In 2000, the Millennium Summit led to the adoption of the MDGs. Finally, the UN Sustainable Development Summit in 2015 resulted in the official adoption of the seventeen Sustainable Development Goals.

96. (B) Advocacy, implementation, and holding power accountable
Civil society organizations play a multifaceted role in the implementation of Sustainable Development Goals. They advocate for the needs of marginalized groups, implement projects at the grassroots level, and monitor government actions to ensure accountability. CSOs are essential for bridging the gap between global policy and local action, providing valuable feedback and expertise to ensure that development efforts are effective, equitable, and reach those most in need.

97. (A) Link gender goals to fiscal commitments and tracking
The primary goal of gender budgeting is to ensure that gender equality objectives are translated into actual financial commitments within the government's budget. By using a gender lens, policymakers can identify how different spending decisions affect men and women differently. This process allows for better tracking of resources and helps ensure that public funds are being used to reduce gender disparities and promote empowerment.

98. (B) SDG 5
Madhya Pradesh has utilized gender budgeting as a strategic tool to advance Sustainable Development Goal 5, which focuses on gender equality. By analyzing the state budget through a gender lens, the government can more effectively allocate funds to programs that support women's health, education, and economic participation. This systematic approach ensures that gender considerations are integrated into all aspects of state-level policy and resource management.

99. (D) The Companies Act, 2013
The Companies Act of 2013 is a landmark piece of legislation in India that legally mandates certain companies to spend a portion of their profits on Corporate Social Responsibility activities. This requirement encourages the private sector to contribute to social and environmental development projects, many of which align with the Sustainable Development Goals. By integrating CSR into corporate strategy, businesses play a significant role in growth.

100. (D) The Principle of Intergenerational Equity
The principle of intergenerational equity is a foundational concept of sustainable development, stating that the current generation has a duty to preserve natural resources for future generations. It implies that we are trustees of the environment and must manage it in a way that does not diminish the opportunities of those who come after us. This ethical framework ensures that long-term sustainability is prioritized.

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populations due to starvation
(B) A substantial and exponential increase in top carnivore numbers
(C) A massive increase in the total solar energy absorbed by the area
(D) A significant decrease in the rate of sedimentary chemical cycling

18. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): The biosphere relies heavily on the lithosphere, hydrosphere, and atmosphere.
Reason (R): The lithosphere, hydrosphere, and atmosphere provide the essential non-living components necessary to sustain living organisms.
(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

19. Which of the following is a correctly matched pair?
(A) Producers - Heterotrophs
(B) Primary Consumers - Carnivores
(C) Secondary Consumers - Autotrophs
(D) Decomposers - Saprotrophs

20. The ecological relevance of desert-like conditions in specific regions is best attributed to which of the following?
(A) Erratic rainfall patterns, high evapotranspiration, and degraded land
(B) High annual precipitation exceeding 200 cm
(C) Abundant glacial meltwater streams
(D) Dense canopy cover preventing sunlight from reaching the ground

21. Identify the incorrect pair regarding the steps of the nitrogen cycle.
(A) Ammonification - Breakdown of organic nitrogen into ammonia
(B) Nitrification - Oxidation of ammonia into nitrites and nitrates
(C) Nitrogen Fixation - Animal protein synthesis from atmosphere
(D) Denitrification - Reduction of soil nitrates back into nitrogen gas

22. Which of the following represents an incorrect pair regarding ecosystems?
(A) Estuary Ecosystem - Aquatic Ecosystem
(B) Coral Reef Ecosystem - Terrestrial Ecosystem
(C) Desert Ecosystem - Terrestrial Ecosystem
(D) Grassland Ecosystem - Terrestrial Ecosystem

23. Consider the following statements regarding the ecology of semi-arid regions like Bundelkhand:
I. It is characterized by severe water scarcity and high summer temperatures.
II. It supports dense evergreen forests due to occasional monsoon showers.
III. It features drought-resistant vegetation adapted to low moisture.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

24. Consider the following statements regarding food chain lengths:
Statement I: Food chains in nature rarely extend beyond four to five trophic levels.
Statement II: Successive energy losses at each trophic level severely limit the energy available to higher-order predators.
Which of the following is correct?
(A) Both Statement I and Statement II are true, and Statement II explains Statement I
(B) Both Statement I and Statement II are true, but Statement II does not explain Statement I
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

25. Which of the following is an incorrect statement regarding a forest ecosystem?
(A) It generally exhibits a highly stratified structure with a canopy, understory, and forest floor
(B) It contributes minimally to the global carbon biogeochemical cycle
(C) It is characterized by complex food webs compared to simple grasslands
(D) It provides vital habitats for a diverse range of terrestrial biodiversity

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work through the provision of public services and infrastructure. A key strategy for achieving this is promoting shared responsibility within the household and the family. By encouraging a more equitable division of domestic labor, society can reduce the disproportionate burden on women, allowing them more time for education and employment.

61. (C) Freshwater rivers and wetlands
Although Sustainable Development Goal 14 primarily focuses on oceans and marine resources, its principles of water conservation are applied to inland states like Madhya Pradesh through the protection of freshwater ecosystems. This includes the conservation of rivers, lakes, and wetlands, which are vital for biodiversity and human survival. Protecting these water bodies ensures the health of aquatic life and maintains the ecological balance of the region.

62. (B) 0 to 100
The NITI Aayog SDG India Index uses a composite score to measure the progress of states and union territories. This score ranges from zero to one hundred, where a higher score indicates greater progress toward achieving the Sustainable Development Goals. This standardized scale allows for a clear comparison between different regions and helps identify which areas require more focused policy intervention and resource allocation.

63. (A) P-3, Q-2, R-1, S-4
The Sustainable Development Goals are systematically organized to address various aspects of development. Goal 5 is dedicated to achieving gender equality and empowering all women and girls. Goal 6 focuses on ensuring the availability and sustainable management of water and sanitation. Goal 7 aims to ensure access to affordable and clean energy. Goal 8 promotes decent work and sustained, inclusive economic growth.

64. (C) Empowering Gram Sabhas with land/water rights
The implementation of PESA Rules in Madhya Pradesh supports the localization of Sustainable Development Goals by empowering Gram Sabhas in tribal areas. This gives local communities more control over their land, water, and forest resources. By involving citizens in the management of their environment and livelihoods, the state promotes inclusive governance and ensures that development is sustainable and culturally appropriate for indigenous populations.

65. (A) Providing legal identity for all citizens
One of the specific targets under Sustainable Development Goal 16 is to provide legal identity for all, including birth registration, by 2030. This is essential for ensuring that individuals can access their rights and public services. A legal identity is a foundation for justice and inclusion, as it allows citizens to participate fully in society and hold institutions accountable for their actions.

66. (A) Ministry of Statistics and Programme Implementation (MoSPI)
The Ministry of Statistics and Programme Implementation is the nodal agency in India responsible for the National Indicator Framework. This framework consists of a set of indicators used to monitor the country's progress toward the seventeen Sustainable Development Goals. By collecting and analyzing data across different sectors, the ministry provides a scientific basis for evaluating the effectiveness of national policies and programs.

67. (C) SDG 11
The Pradhan Mantri Awas Yojana (Urban) aims to provide affordable housing for the urban poor, which is a key component of Sustainable Development Goal 11. This goal focuses on making cities inclusive, safe, and sustainable. By ensuring that every citizen has access to adequate and secure housing, the program helps reduce the prevalence of slums and improves the overall living standards in urban areas.

68. (B) NITI Aayog
NITI Aayog, the premier policy think tank of the Government of India, is responsible for developing and publishing the SDG India Index. This annual report tracks the performance of all states and union territories across the seventeen global goals. By ranking regions and identifying front-runners and aspirants, NITI Aayog fosters a spirit of competitive federalism that encourages states to improve their sustainability outcomes.

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reach a climax community
(C) It always begins with the establishment of large hardwood trees
(D) It occurs primarily in established soil environments

34. Find the odd one out among the following regarding non-timber forest products (NTFPs) prominent in Madhya Pradesh.
(A) Tendu leaves
(B) Mahua flowers
(C) Sal seeds
(D) Teak timber logs

35. India is globally recognized as a megadiverse country. Roughly what percentage of the world's total land area does India possess to support its immense biodiversity?
(A) 8.1 percent
(B) 2.4 percent
(C) 15.6 percent
(D) 25.0 percent

36. Consider the concept of forest ecosystems in Madhya Pradesh. If the canopy of a dense Teak forest is completely removed, what immediate effect will it have on the undergrowth?
(A) Shade-loving plants will perish while sun-loving weeds proliferate
(B) The local undergrowth will permanently vanish due to extreme cold
(C) The soil will instantly turn into hard rock, preventing any life
(D) The water retention capacity of the soil will increase drastically

37. Consider the following statements regarding ecological succession:
I. Primary succession begins in an essentially lifeless area where no soil previously existed.
II. Secondary succession occurs faster than primary succession because soil is already present.
III. The pioneer species in primary succession on bare rocks are typically lichens.
IV. The climax community is highly unstable and changes constantly.
V. The sequence of successional stages is referred to as a sere.
Which of the above statements are correct?
(A) I, II, III and V only
(B) I, II, III and IV only
(C) II, III, IV and V only
(D) I, III, IV and V only

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38. Identify the correct pair regarding the levels of biodiversity.
(A) Alpha diversity - Genetic variation within a single local population
(B) Gamma diversity - Total diversity of genes in a single organism unit
(C) Species diversity - The physical variation of landscapes in a biome
(D) Beta diversity - Species diversity between two distinct communities

39. Madhya Pradesh is particularly famous for a valuable timber species that dominates its southern and central forest circles, such as Hoshangabad and Betul. Which species is this?
(A) Sal (Shorea robusta)
(B) Sandalwood (Santalum album)
(C) Pine (Pinus roxburghii)
(D) Teak (Tectona grandis)

40. Which of the following acts as the most common trigger for secondary ecological succession?
(A) A volcanic eruption forming a layer of new igneous rock
(B) The retreat of a massive glacier exposing bare bedrock
(C) The formation of an entirely new island in the ocean
(D) Forest fire clearing vegetation but leaving the soil intact

41. Extensive deforestation in the catchment areas of Madhya Pradesh rivers will directly trigger which cause-and-effect scenario?
(A) An increase in groundwater recharge and enhanced soil fertility
(B) Accelerated topsoil erosion and increased siltation in major reservoirs
(C) A notable reduction in atmospheric carbon dioxide levels
(D) The sudden natural conversion of degraded lands into high-yield agricultural plots

42. Which of the following traits is most characteristic of a climax community?
(A) High rate of annual species turnover
(B) Simple food chains and low biomass

between parks

73. The Narmada river flows through a rift valley. Which of the following best describes its surrounding ecosystem and biodiversity?
(A) It is entirely flanked by mangrove forests along its entire length
(B) It passes exclusively through a barren cold desert ecosystem profile
(C) Its basin is completely devoid of any native mammalian wildlife types
(D) It has rich riparian vegetation and diverse tropical deciduous forests

74. Identify the correct statement regarding the Leopard population in Madhya Pradesh.
(A) Madhya Pradesh has the lowest population of leopards among all Indian states
(B) Leopards are primarily found and restricted only to aquatic environments
(C) Madhya Pradesh has the highest leopard population, the 'Leopard State'
(D) The Wildlife Protection Act places the leopard in Schedule V as vermin

75. What is the most appropriate ecological significance of designating a site like Sakhya Sagar as a wetland of international importance?
(A) It permits unregulated commercial fishing by international corporations
(B) It converts the wetland into a dry land zone for agricultural expansion
(C) It transfers the ownership of the wetland directly to the United Nations
(D) It highlights the site's role in hydro-ecology, birds, and crocodiles

76. Which was the first National Park in Madhya Pradesh to be included under Project Tiger?
(A) Bandhavgarh National Park
(B) Panna National Park
(C) Satpura National Park
(D) Kanha National Park

77. Consider the following statements about the Pachmarhi Biosphere Reserve:
Statement I: It is located in the Satpura Range of Madhya Pradesh.
Statement II: It was established exclusively for the conservation of marine corals.
Which of the following is correct?
(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true and Statement II is false
(D) Statement I is false and Statement II is true

78. Consider the following statements about Bandhavgarh National Park:
Statement I: It has historically been famous for having one of the highest known densities of tiger populations in India.
Statement II: It is situated in the Vindhya hills and features a historic fort within its core area.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

79. The active management of grasslands in Kanha National Park through controlled burning is an ecological strategy primarily aimed at which of the following?
(A) Eradicating all insect life and parasites within the park area
(B) Maintaining the grassy meadows essential for Barasingha survival
(C) Promoting the unhindered growth of large timber trees in meadows
(D) Decreasing the aesthetic value of the park for visiting tourists

80. A major ecological threat contributing to the decline of Gharials in the Chambal river ecosystem is linked to which cause-and-effect relation?
(A) Excessive tree planting along the river banks reducing overall water flow
(B) Overpopulation of herbivorous fish depleting their natural food source
(C) Introduction of pure freshwater from canal projects diluting the river
(D) Illegal sand mining destroying riverbank nesting and basking sites

81. In the context of a Biosphere Reserve, what is the primary function of the strict "Core Zone"?
(A) To allow heavy industrial mining and

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51. Which of the following is an exception to the major forest types officially recognized in Madhya Pradesh?
(A) Tropical Moist Deciduous Forests
(B) Tropical Dry Deciduous Forests
(C) Tropical Thorn Forests
(D) Mangrove Tidal Forests

52. If a population significantly overshoots the carrying capacity of its environment, which cause-and-effect relationship is most likely to occur?
(A) The carrying capacity will automatically increase to accommodate the population
(B) The population will undergo instantaneous genetic mutation to require fewer resources
(C) All intra-specific competition will cease entirely
(D) Resources will become depleted, leading to a population crash

53. Match the biodiversity concepts in List I with their corresponding details in List II.
List I: (Biodiversity Concept)
P. Western Ghats
Q. Indo-Burma Region
R. Megadiverse Status
S. Endemic Species
List II: (Details)
1. Recognition given to India due to its vast biological wealth
2. Species restricted to a specific geographical area
3. Biodiversity hotspot located along India's eastern frontiers
4. Hotspot renowned for high amphibian diversity and endemism
Select the correct code:
(A) P-3, Q-4, R-2, S-1
(B) P-4, Q-3, R-1, S-2
(C) P-1, Q-2, R-4, S-3
(D) P-4, Q-1, R-3, S-2

54. Match the tree species in List I with their primary ecological or economic relevance in Madhya Pradesh in List II.
List I: (Species)
P. Teak
Q. Sal
R. Bamboo
S. Mahua
List II: (Relevance)
1. Major NTFP utilized heavily in the traditional tribal economy for food and beverages
2. Fast-growing grass used extensively in paper, housing, and rural livelihoods
3. Dominant timber species of the eastern moist deciduous forests (e.g., Mandla, Balaghat)
4. Premium timber dominating the central and southern forests (e.g., Hoshangabad)
Select the correct code:
(A) P-1, Q-3, R-2, S-4
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-2, R-3, S-1
(D) P-4, Q-3, R-2, S-1

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55. Habitat loss and fragmentation are widely recognized as the primary cause for which major environmental effect?
(A) The severe decline and extinction of native biodiversity
(B) Rapid increase in endemic species population
(C) The spontaneous generation of new climax communities
(D) Global reduction of invasive alien species

56. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A population can grow exponentially forever without facing any ecological limits.
Reason (R): Carrying capacity dictates the maximum population size an ecosystem can sustainably support based on available resources.
(A) Both (A) and (R) are true and (R) is the correct explanation of (A).
(B) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(C) (A) is true but (R) is false.
(D) (A) is false but (R) is true.

57. Which of the following provides the most appropriate explanation for the economic value of bamboo forests in Madhya Pradesh?
(A) It provides raw material for paper and crafts, supporting tribal livelihoods
(B) Bamboo acts as a slow-growing hardwood

that replaces Teak in luxury furniture
(C) Bamboo is predominantly exported to European countries as a rare decorative plant
(D) Bamboo forests are primarily utilized for large-scale commercial fruit production

58. Consider the following statements regarding biodiversity:
Statement I: Genetic biodiversity refers to the variation of genes within a single species.
Statement II: Ecosystem biodiversity refers to the variety of different habitats, communities, and ecological processes in a region.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct and Statement II is incorrect
(D) Statement I is incorrect and Statement II is correct

59. Consider the following statements regarding the forest cover and types in Madhya Pradesh:
I. Madhya Pradesh has the largest total forest cover area in India.
II. Teak is primarily found in the tropical moist deciduous forests of the state.
III. Sal forests are completely absent in the eastern districts of Madhya Pradesh.
IV. Bamboo represents an economically valuable non-timber forest product in the state.
Which of the above statements are correct?
(A) I, II and IV only
(B) III only
(C) II and III only
(D) I and IV only

60. Consider the following statements about biodiversity in India:
I. India is officially recognized as one of the 17 megadiverse countries in the world.
II. The Indo-Burma biodiversity hotspot excludes the northeastern states of India.
III. The Western Ghats are known for high levels of species endemism.
Which of the above statement(s) is/are correct?
(A) I and III only
(B) II only
(C) I and II only
(D) II and III only

61. Arrange the following environmental laws and initiatives in India in the correct chronological sequence of their enactment or formal launch:
1. Forest Rights Act
2. Wildlife Protection Act
3. Project Tiger
4. Biological Diversity Act
Select the correct sequence:
(A) 2, 3, 4, 1
(B) 3, 2, 1, 4
(C) 2, 4, 3, 1
(D) 4, 2, 3, 1

62. If strict anti-poaching and habitat protection measures were abruptly removed from the Chambal river basin, what would be the most immediate negative consequence?
(A) Gharials would collapse due to nesting site loss and net entanglement
(B) The total water level of the Chambal river would rise uncontrollably
(C) Transformation of the ravine landscape into dense evergreen forests
(D) Rapid migration of Gangetic dolphins into nearby arid desert regions

63. Match the National Parks of Madhya Pradesh in List I with their associated flagship species or features in List II.
List I: (National Park)
P. Kanha
Q. National Chambal Sanctuary
R. Panna
S. Satpura
List II: (Associated Feature)
1. Rugged terrain and deep gorges (Dhoopgarh)
2. Gharial and Gangetic Dolphin conservation
3. Successful Tiger Reintroduction and Ken River
4. Hard Ground Barasingha conservation
Select the correct code:
(A) P-2, Q-4, R-1, S-3
(B) P-4, Q-2, R-3, S-1
(C) P-4, Q-3, R-2, S-1
(D) P-3, Q-1, R-4, S-2

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64. Find the odd one out among the following protected areas.
(A) Pachmarhi Biosphere Reserve
(B) Achanakmar-Amarkantak Biosphere Reserve
(C) Nilgiri Biosphere Reserve
(D) Panna Biosphere Reserve

65. The National Chambal Sanctuary is primarily dedicated to the conservation of which critically endangered aquatic reptile?
(A) Gharial
(B) Saltwater Crocodile
(C) Mugger Crocodile
(D) Olive Ridley Turtle

66. Which of the following is NOT a recognized zone within the standard structure of a Biosphere Reserve?
(A) Exploitation Zone
(B) Buffer Zone
(C) Transition Zone
(D) Core Zone

67. Consider the following statements about National Parks in Madhya Pradesh:
I. Kanha National Park is renowned for the conservation of Hard Ground Barasingha.
II. Bandhavgarh National Park historically boasts a high density of Bengal tigers.
III. Pench National Park is shared geographically between Madhya Pradesh and Maharashtra.
IV. Satpura National Park is devoid of any rugged terrain or deep gorges.
V. Panna National Park witnessed a successful tiger reintroduction program.
Which of the above statements are correct?
(A) I, II, III and V only
(B) I, II, IV and V only
(C) II, III, IV and V only
(D) I, III, IV and V only

68. Consider the following statements about the Swamp Deer (Barasingha):
Statement I: The subspecies found in Kanha is adapted to hard ground conditions, unlike the swamp-dwelling subspecies of northern India.
Statement II: The successful revival of its population in Kanha involved the creation of specialized tall grass enclosures.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct and Statement II is incorrect
(D) Statement I is incorrect and Statement II is correct

69. Identify the incorrect statement concerning the wetlands of Madhya Pradesh.
(A) Madhya Pradesh has no officially recognized Ramsar sites within its borders
(B) Bhoj Wetland is a significant Ramsar site situated within the city of Bhopal
(C) Sakhya Sagar was designated a Ramsar site to protect its aquatic biodiversity
(D) Yashwant Sagar in Indore is officially recognized as a Ramsar wetland site

70. Find the odd one out among the following Wildlife Sanctuaries based on their geographic location.
(A) Nauradehi Wildlife Sanctuary
(B) Ratapani Wildlife Sanctuary
(C) Dandeli Wildlife Sanctuary
(D) Bori Wildlife Sanctuary

71. Pachmarhi was the first recognized Biosphere Reserve in Madhya Pradesh. What is one of its notable botanical characteristics?
(A) Abundance of giant ferns and endemic Sal and Teak associates
(B) The widespread presence of extensive coastal Mangrove forests
(C) Dominance of Chinar trees normally found in colder climates
(D) Presence of widespread Alpine scrub and tundra vegetation

72. The concept of "Wildlife Corridors" (e.g., Kanha-Pench corridor) is critical for which ecological outcome?
(A) Confining all herbivores to a restricted geographical zone to prevent overgrazing
(B) Preventing genetic isolation of tiger populations and facilitating natural dispersal
(C) Encouraging the widespread growth of invasive alien plant species
(D) Blocking the migration of all avian fauna

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(C) Relative stability and self-perpetuation
(D) Complete absence of heterotrophic organisms

43. Which of the following is the correct sequence of the hierarchical levels of biological diversity, from the narrowest biological scale to the broadest?
(A) Species diversity → Genetic diversity → Ecosystem diversity
(B) Ecosystem diversity → Species diversity → Genetic diversity
(C) Genetic diversity → Ecosystem diversity → Species diversity
(D) Genetic diversity → Species diversity → Ecosystem diversity

44. Which factual statement describes a primary criterion for a region to be designated as a biodiversity hotspot?
(A) It must possess a completely undisturbed human population base
(B) It must be located exclusively in polar regions or alpine zones
(C) It must consist primarily of marine and deep-water ecosystems
(D) It must have 1500 endemic vascular plants and 70% habitat loss

45. Identify the correct pair concerning forest distribution in Madhya Pradesh.
(A) Western Madhya Pradesh - Dominant Sal Forests
(B) Northern Madhya Pradesh (Chambal region) - Dense Tropical Evergreen Forests
(C) Eastern Madhya Pradesh (Mandla, Dindori) - Dominant Sal Forests
(D) Southern Madhya Pradesh - Exclusive Alpine Vegetation

46. Which of the following is the standard definition of carrying capacity in ecology?
(A) The absolute minimum number of individuals required for a species to survive
(B) The maximum species population size an environment can sustain indefinitely
(C) The total number of distinct species present in a particular geographic area
(D) The rate at which a damaged ecosystem recovers from a severe natural disaster

47. Consider the following statements about Tropical Moist Deciduous forests in Madhya Pradesh:
Statement I: They require higher annual rainfall compared to dry deciduous forests.
Statement II: They shed their leaves completely for the entire duration of the monsoon season.
Which of the following is correct?
(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true and Statement II is false
(D) Statement I is false and Statement II is true

48. Arrange the following seral stages of primary succession on a bare rock in the correct chronological order:
1. Bare Rock
2. Mosses
3. Lichens
4. Trees
5. Herbaceous Plants

Select the correct sequence:
(A) 1, 2, 3, 5, 4
(B) 1, 3, 2, 5, 4
(C) 1, 3, 5, 2, 4
(D) 1, 5, 2, 3, 4

49. What does the term "Ecosystem Diversity" specifically encompass?
(A) The variety of habitats, biotic communities, and ecological processes functioning in a region
(B) The total number of genes in a single isolated plant species
(C) Only the marine ecosystems present within a nation's borders
(D) The physical variation observed exclusively among individual mammals of the same species

50. What is the most appropriate ecological reason explaining why tropical regions generally hold greater biodiversity than temperate regions?
(A) Tropical environments have been highly unstable over millions of years
(B) Tropical regions suffer from severe winters that force rapid evolution
(C) Tropics have more solar energy and stable, predictable climates
(D) Tropical ecosystems lack dense vegetation, aiding new species survival

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infrastructure development
(B) To act as the main center for intensive modern agriculture
(C) A legally protected ecosystem for conserving biological diversity
(D) To provide unchecked access for mass commercial tourism activities

82. Which of the following protected areas in Madhya Pradesh is explicitly NOT designated as a Tiger Reserve under Project Tiger?
(A) Madhav National Park
(B) Sanjay-Dubri
(C) Bandhavgarh
(D) Satpura

83. The Hard Ground Barasingha (Cervus duvauceli branderi) is the state animal of Madhya Pradesh. What is its endemic ecological status?
(A) It is found naturally in every district of Madhya Pradesh
(B) It is a migratory species that visits Madhya Pradesh only during the monsoon
(C) It was brought to Madhya Pradesh from the swamps of Assam
(D) It is exclusively endemic to the Kanha Tiger Reserve landscape

84. Which of the following is a correctly matched pair regarding major wetlands/rivers and their associated sanctuaries in Madhya Pradesh?
(A) Ken River - National Chambal Sanctuary
(B) Narmada River - Karera Bustard Sanctuary
(C) Son River - Son Gharial Sanctuary
(D) Betwa River - Ghatigaon Sanctuary

85. Which of the following endangered or protected animal species is NOT historically documented as native to the forests or rivers of Madhya Pradesh?
(A) Sloth Bear
(B) Dhole (Indian Wild Dog)
(C) Snow Leopard
(D) Indian Pangolin

86. Identify the incorrect statement regarding Pench National Park.
(A) It derives its name from the Pench River that flows through it
(B) It is believed to be the inspiration behind Rudyard Kipling's "The Jungle Book"
(C) It spans across the Seoni and Chhindwara districts of Madhya Pradesh
(D) It is completely isolated and lacks any tiger corridors connecting it to other reserves

87. Rapid urbanization and unregulated sewage discharge into lakes like the Upper Lake of Bhopal directly cause which severe ecological degradation?
(A) Oligotrophication, making the water devoid of all nutrients
(B) Eutrophication, leading to algal blooms and oxygen depletion
(C) Instantaneous conversion of the lake into a terrestrial desert
(D) Natural purification of the water body enhancing fish populations

88. The dramatic recovery of the tiger population in Panna National Park from a state of zero local tigers is a direct cause-and-effect result of which wildlife management strategy?
(A) The complete elimination of all natural prey species within the park
(B) Active translocation and reintroduction of tigers from other reserves
(C) Intentional introduction of African lions to compete with leopards
(D) Deforestation of the core zone to improve habitat visibility for tourists

89. Sakhya Sagar, an important wetland recognized under the Ramsar Convention, is situated within the boundaries of which National Park in Madhya Pradesh?
(A) Panna National Park
(B) Madhav National Park
(C) Pench National Park
(D) Fossil National Park

90. Which of the following pairs concerning wildlife species and their primary conservation centers in Madhya Pradesh is incorrect?
(A) Indian Wild Ass - Panna National Park
(B) Gharial - National Chambal Sanctuary
(C) Hard Ground Barasingha - Kanha National Park
(D) Great Indian Bustard (Sonchiriya) - Karera Sanctuary

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ANSWERS

1. (D) It receives solar energy from the sun and exchanges energy and matter with its surroundings
The biosphere functions as an open system because it continuously receives radiant solar energy from the sun while exchanging both energy and matter with its external environment. This dynamic interaction ensures the flow of nutrients and energy across various components, including the lithosphere, hydrosphere, and atmosphere, which is essential for sustaining all biological life forms.

2. (C) Coral Reef
Ecosystems are broadly classified into terrestrial and aquatic categories based on their primary environment. Taiga, Tundra, and Tropical Rainforests represent diverse terrestrial biomes characterized by land-based vegetation and climate patterns. In contrast, Coral Reefs are marine ecosystems existing entirely underwater, making them distinct from the land-based systems listed, thus serving as the odd classification in this group.

3. (C) Soil moisture
Abiotic components comprise the non-living physical and chemical elements of an ecosystem that influence living organisms. Soil moisture is a critical physical factor that determines water availability for plants and microbes. Unlike herbivores, decomposers, and primary producers, which are all living biotic entities, soil moisture remains a strictly physical environmental variable necessary for the survival of biological communities.

4. (C) Phosphorus cycle
Biogeochemical cycles are categorized into gaseous and sedimentary types based on their primary reservoir. Carbon, nitrogen, and oxygen cycles are predominantly gaseous as their main reservoirs exist in the atmosphere. The phosphorus cycle is an exception because phosphorus primarily cycles through the Earth's crust and soil in a sedimentary manner, lacks a significant gaseous phase, and moves slowly.

5. (B) Recurring fires and periodic seasonal drought conditions
Grassland ecosystems are maintained by a combination of environmental factors that inhibit the growth of woody trees while favoring grasses. Periodic seasonal droughts and recurring natural or human-induced fires are the primary drivers that prevent tree seedlings from establishing themselves permanently. These factors ensure the landscape remains dominated by herbaceous vegetation and grasses, which are better adapted to these specific disturbances.

6. (B) Diverse bacteria and cyanobacteria
Atmospheric nitrogen exists as a stable gas that most organisms cannot directly utilize for protein synthesis. Biological nitrogen fixation is the vital process of converting this gas into ammonia or nitrates. This transformation is primarily performed by specialized bacteria and cyanobacteria, which possess the nitrogenase enzyme. These microbes may live freely in the soil or form symbiotic relationships with plants.

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(B) A unit where living organisms interact with each other and their physical environment
An ecosystem represents a functional unit of nature where living organisms, such as plants, animals, and microbes, interact with one another and their physical environment. This interaction involves a complex exchange of energy and nutrients between the biotic and abiotic components. It is a self-sustaining system characterized by various ecological processes like energy flow, nutrient cycling, and biological productivity.

8. (B) Grass → Grasshopper → Frog → Snake → Eagle
In a terrestrial grazing food chain, energy moves sequentially through different trophic levels starting from primary producers. Grass captures solar energy and is consumed by grasshoppers, which are primary consumers. Frogs then eat the grasshoppers, followed by snakes consuming the frogs. Finally, eagles act as top predators. This

(A) The direct collection of Tendu leaves
(B) Harvesting of Bamboo for construction
(C) Extraction of medicinal plants from wild
(D) Carbon sequestration by a growing forest

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91. Which of the following is NOT a right recognized under the Forest Rights Act (FRA), 2006?
(A) Right to hold and live in the forest land under individual or common occupation for habitation or self-cultivation
(B) Right to commercially log timber from the core zones of Tiger Reserves without permission
(C) Right of ownership, access to collect, use, and dispose of minor forest produce
(D) Rights to protect, regenerate, or conserve any community forest resource

92. In which year was the landmark Wildlife Protection Act enacted in India, providing the legal framework for protected areas?
(A) 1927
(B) 1972
(C) 1980
(D) 1986

93. What does the Nagoya Protocol under the Convention on Biological Diversity (CBD) strictly govern?
(A) The complete ban on all international trade of forest timber
(B) The phase-out of all ozone-depleting chemical substances
(C) The regulation of international greenhouse gas emissions
(D) Access to genetic resources and fair sharing of their benefits

94. The biological mechanism of Access and Benefit Sharing (ABS) is a cornerstone of which international agreement?
(A) The Kyoto Protocol
(B) The Montreal Protocol
(C) The Nagoya Protocol
(D) The Basel Convention

95. The widespread proliferation of Lantana camara in forest ecosystems serves as a prime example of which ecological issue?
(A) Invasive species outcompeting native flora and reducing fodder
(B) The successful conservation of native endemic plant populations
(C) The positive result of mutualistic symbiosis between species
(D) The rapid and natural recovery of climax hardwood forest types

96. Identify the correct statement regarding the Convention on Biological Diversity (CBD).
(A) It exclusively covers protection of mammalian species like tigers
(B) A treaty for biodiversity conservation and fair benefit sharing
(C) It was drafted and signed during the Paris Climate Agreement
(D) It encourages the introduction of invasive species into habitats

97. Ecosystem services are widely categorized for economic valuation and conservation policy. Which is the most appropriate description of "Regulating Services"?
(A) Processes like climate regulation, water purification, and pollination
(B) The physical products obtained from ecosystems, like food and timber
(C) Non-material benefits obtained, like spiritual enrichment and recreation
(D) The basic services necessary for the production of all other functions

98. Which of the following is a correctly matched pair regarding environmental legislation in India?
(A) Biological Diversity Act - 1972
(B) Forest Conservation Act - 2002
(C) Forest Rights Act - 2006
(D) Wildlife Protection Act - 1986

99. Identify the incorrect statement regarding the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
(A) It recognizes and vests forest rights in forest-dwelling tribes
(B) It acknowledges historical injustice faced by forest communities
(C) It grants the right to collect and dispose of minor forest produce
(D) It grants tribal communities sovereign control over national parks

100. Find the odd one out among the following ecosystem services based on its classification as a "Provisioning Service" (goods directly harvested).

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linear pathway illustrates how chemical energy is transferred throughout the ecosystem.

9. (B) 100 Joules
The ten percent law states that only about ten percent of the energy available at one trophic level is transferred to the next level. If plants capture 10,000 Joules of energy, primary consumers receive 1,000 Joules after metabolic losses. Consequently, the secondary consumers, which occupy the third trophic level, will receive ten percent of that amount, totaling 100 Joules.

10. (C) Botanical garden
Natural terrestrial ecosystems like tropical rainforests, temperate grasslands, and hot deserts are self-regulating systems formed through ecological processes without significant human intervention. A botanical garden is an artificial or man-made ecosystem because it is deliberately designed, planted, and maintained by humans for research, conservation, or aesthetic purposes. Therefore, it does not occur naturally in the environment like the others.

11. (D) Nutrient cycling would stop, leaving dead organic matter to accumulate
Decomposers play a fundamental role in ecosystems by breaking down dead organic matter into simple inorganic nutrients. If these organisms were removed, the recycling of essential elements like nitrogen and phosphorus would cease entirely. Consequently, nutrients would remain locked in dead carcasses and leaf litter, leading to an accumulation of organic waste and eventually starving living plants of essential minerals.

12. (C) Fungi
Environmental factors are classified into biotic and abiotic categories. Sunlight, topography, and precipitation are abiotic factors that represent the non-living physical and chemical environment influencing life. Fungi are living organisms that serve as decomposers within an ecosystem, making them a biotic component. Because fungi are the only living entity in this list, they are the odd factor among abiotic ones.

13. (A) A food web represents multiple interconnected food chains within an ecosystem
A food chain represents a single, linear pathway through which energy and nutrients flow from producers to top predators. In contrast, a food web consists of several interconnected food chains that represent the complex feeding relationships within an ecosystem. This network more accurately reflects natural systems, where most organisms consume multiple types of food and are preyed upon by various species.

14. (C) They filter out pollutants and purify water before it reaches rivers and lakes
Wetlands are frequently described as the kidneys of the landscape because of their vital ecological role in water filtration. As water moves through these systems, the vegetation and microbes trap sediment and absorb excess nutrients and pollutants. This natural process purifies the water before it flows into larger rivers and lakes, effectively filtering the environment much like biological kidneys do.

15. (D) Photosynthesis and aerobic respiration
The global carbon cycle is primarily regulated by the balance between two fundamental biological processes. During photosynthesis, green plants and algae remove carbon dioxide from the atmosphere to produce organic matter. Conversely, aerobic respiration performed by both plants and animals breaks down this organic matter, releasing carbon dioxide back into the air. These opposing processes continuously cycle carbon through the biosphere.

16. (B) P-3, Q-4, R-1, S-2
The Earth's environment is divided into distinct spheres with specific characteristics. The lithosphere encompasses the solid outer crust and upper mantle, while the hydrosphere includes all water bodies on the surface. The atmosphere is the gaseous layer surrounding the planet. Finally, the biosphere represents the narrow zone of interaction where the other three spheres meet, allowing various forms of life to exist.

17. (A) A rapid decline in primary consumer populations due to starvation
Primary producers, such as green plants and algae, form the essential base of all food chains by converting solar energy into food. If their

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population declines sharply, the available energy for the next trophic level decreases immediately. This leads to a rapid decline in primary consumer populations as they face starvation, which subsequently impacts all higher-order predators within the entire ecosystem.

18. (A) Both (A) and (R) are true and (R) is the correct explanation of (A).
The biosphere is the global sum of all ecosystems and represents the zone of life on Earth. It cannot exist in isolation because it relies entirely on the other three spheres. The lithosphere provides soil and minerals, the hydrosphere provides essential water, and the atmosphere provides gases like oxygen and carbon dioxide. These abiotic components are fundamental requirements for sustaining life.

19. (D) Decomposers - Saprotrophs
In ecological classification, organisms are grouped based on how they obtain energy. Decomposers are correctly identified as saprotrophs because they derive nutrients from dead and decaying organic matter through extracellular digestion. Producers are autotrophs, not heterotrophs. Primary consumers are herbivores rather than carnivores, and secondary consumers are heterotrophs that eat primary consumers, making the match for decomposers the only accurate pair.

20. (A) Erratic rainfall patterns, high evapotranspiration, and degraded land
Arid and desert-like conditions are characterized by extreme moisture deficits in the environment. This occurs primarily due to erratic and low rainfall patterns combined with high rates of evapotranspiration, where water loss from soil and plants exceeds precipitation. Over time, these factors, often exacerbated by land degradation, lead to the development of sparse vegetation and soil types typical of desert ecosystems.

21. (C) Nitrogen Fixation - Animal protein synthesis from atmosphere
Nitrogen fixation is the biological or chemical process that converts atmospheric nitrogen gas into ammonia or nitrates, which plants can then absorb. It is not the process of animal protein synthesis from the atmosphere, as animals must consume plants or other animals to obtain nitrogen. The other stages, including ammonification, nitrification, and denitrification, are correctly described in their respective ecological roles.

22. (B) Coral Reef Ecosystem - Terrestrial Ecosystem
Ecosystems are classified based on their primary habitat as either terrestrial or aquatic. Deserts, grasslands, and forests are terrestrial because they exist on land. Estuaries are aquatic because they are water-based environments. Coral reefs are marine systems located entirely underwater, which classifies them as aquatic ecosystems. Labeling a coral reef as a terrestrial ecosystem is incorrect because it lacks land-based characteristics.

23. (C) I and III only
Semi-arid regions like Bundelkhand are defined by specific climatic and botanical features. These areas experience severe water scarcity and extremely high temperatures during the summer months. Consequently, the vegetation consists of drought-resistant species adapted to survive with minimal moisture. Because the rainfall is low and seasonal, these regions cannot support dense evergreen forests, which require high and consistent annual precipitation.

24. (A) Both Statement I and Statement II are true, and Statement II explains Statement I
Natural food chains rarely exceed four or five levels due to the inherent inefficiency of energy transfer. According to the ten percent law, most energy is lost as heat during metabolic processes at each stage. This progressive reduction means very little energy remains to support large populations of top predators at higher levels, making Statement II a direct explanation for Statement I.

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25. (B) It contributes minimally to the global carbon biogeochemical cycle
Forest ecosystems play a massive role in the global carbon cycle by acting as significant carbon sinks. Through photosynthesis, trees absorb huge amounts of atmospheric carbon dioxide and store it in their biomass and soil. Claiming they contribute minimally to this cycle is factually incorrect. Forests are actually complex systems with stratified structures that support high levels of terrestrial biodiversity globally.

26. (C) Statement I is correct and Statement II is incorrect
Environmental components are divided into biotic and abiotic categories. Biotic factors include all living organisms like plants and animals. Abiotic factors encompass all non-living components, including physical factors like light and temperature as well as chemical factors like soil nutrients and pH. Statement II is incorrect because it erroneously excludes chemical factors, which are essential parts of the abiotic environment.

27. (C) P-4, Q-3, R-2, S-1
Different biogeochemical cycles have specific primary reservoirs where elements are stored. The carbon cycle relies on oceans and fossil fuels as major sinks. Nitrogen is most abundant in the atmosphere, making it the primary reservoir. Phosphorus is a sedimentary cycle with its main stores in rocks. The water cycle involves the hydrosphere, which includes all the water bodies present on the planet.

28. (A) Artificial aquatic ecosystem
An aquarium is considered an artificial aquatic ecosystem because it is created and maintained by human intervention. Unlike natural systems, it requires regular cleaning, external food input, and artificial aeration to function and sustain life. Because it is a man-made water environment designed for a specific purpose, it fits the definition of an artificial ecosystem rather than a natural one.

29. (A) I, II and IV only
Energy flow in ecosystems is unidirectional, moving from producers to consumers. Raymond Lindeman proposed the ten percent law, explaining energy loss at each level. Autotrophs serve as the foundation by capturing solar energy. However, available energy decreases progressively at higher levels rather than increasing. Therefore, statements I, II, and IV are accurate, while statement III is factually incorrect regarding energy trends.

30. (D) Estuaries are transitional zones where freshwater rivers meet the saline ocean
Aquatic ecosystems vary based on salinity and water movement. Marine systems have high salt concentrations, while freshwater systems have very low levels. Lotic refers to flowing water, whereas lentic refers to standing water. Estuaries represent a unique transitional zone where freshwater from rivers mixes with saline seawater. This creates a highly productive environment with fluctuating salinity levels, making them vital ecological interfaces.

31. (C) No ecosystem has an infinite supply of space and nutrients
Ecological limits refer to the constraints imposed by the environment on the growth and survival of populations. A fundamental truth is that no ecosystem possesses an infinite supply of space, nutrients, or other essential resources. These finite resources eventually limit the size of populations, leading to the concept of carrying capacity. This statement accurately reflects the inherent boundaries of natural systems.

32. (B) It is totally devoid of endemic freshwater turtle species
The Indo-Burma biodiversity hotspot is a vast region known for its high level of endemism across many taxa. It includes parts of northeastern India and spans several countries. A significant characteristic of this region is its remarkable diversity of freshwater turtles, many of which are found nowhere else. Claiming the region is devoid of such endemic turtle species is a factual exception.

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33. (B) It takes hundreds or thousands of years to reach a climax community
Primary succession occurs in areas where no life or soil previously existed, such as on bare rock or newly formed islands. Because there is no initial soil, the process of weathering and organic accumulation is extremely slow. It often takes hundreds or even thousands of years for the environment to develop enough soil and complexity to support a stable climax community.

34. (D) Teak timber logs
Non-timber forest products (NTFPs) include items harvested from forests that are not timber, such as leaves, flowers, and seeds. In Madhya Pradesh, Tendu leaves, Mahua flowers, and Sal seeds are major NTFPs that support tribal economies. Teak timber logs, however, represent wood harvested for lumber. Since teak logs are

eutrophication, triggers the rapid growth of algal blooms. These blooms eventually die and decompose, consuming the dissolved oxygen in the water. This leads to a hypoxic environment where fish and other aquatic organisms cannot survive.

88. (B) Active translocation and reintroduction of tigers from other reserves
The successful recovery of tigers in Panna National Park after their local extinction was the result of a deliberate and scientifically managed translocation program. Tigers were brought from other reserves like Kanha and Bandhavgarh and reintroduced into Panna's protected habitat. This active management strategy, combined with strict protection and monitoring, allowed the population to stabilize and grow, marking a significant victory for conservation.

89. (B) Madhav National Park
Sakhya Sagar is a significant wetland that was created as an artificial lake in the early 20th century. It is located within the boundaries of Madhav National Park in the Shivpuri district of Madhya Pradesh. The lake is an important habitat for mugger crocodiles and numerous migratory birds, which led to its recognition as a wetland of international importance under the Ramsar Convention.

90. (A) Indian Wild Ass - Panna National Park
Species are often associated with specific conservation centers where they are protected. Gharials are found in the Chambal Sanctuary, Barasingha in Kanha, and the Great Indian Bustard in Karera. However, the Indian Wild Ass is endemic to the Little Rann of Kutch in Gujarat and is not found in Panna National Park. This makes the pair associating it with Panna factually incorrect.

91. (B) Right to commercially log timber from the core zones of Tiger Reserves without permission
The Forest Rights Act of 2006 recognizes the rights of forest-dwelling communities to live on forest land and collect minor forest produce. It also allows them to protect and manage community forest resources. However, it does not grant anyone the right to commercially log timber from the core zones of Tiger Reserves. Such activities remain strictly prohibited to ensure the protection of wildlife.

92. (B) 1972
The Wildlife Protection Act is a landmark piece of legislation enacted by the Indian Parliament in 1972. It provides the legal framework for the protection of various species of wild animals and plants, the management of their habitats, and the regulation of trade in wildlife products. This act enabled the establishment of National Parks and Wildlife Sanctuaries across the entire country.

93. (D) Access to genetic resources and fair sharing of their benefits
The Nagoya Protocol is a supplementary agreement to the Convention on Biological Diversity. It strictly governs the access to genetic resources and ensures the fair and equitable sharing of benefits arising from their utilization. This international treaty aims to prevent the unauthorized use of biological resources and traditional knowledge, providing a transparent legal framework for researchers, corporations, and the providers of those resources.

94. (C) The Nagoya Protocol
Access and Benefit Sharing (ABS) is a fundamental principle established to ensure that the benefits derived from genetic resources are shared fairly with the countries and communities of origin. This mechanism is the cornerstone of the Nagoya Protocol. It prevents bio-piracy and encourages the sustainable use of biodiversity by creating a legal link between the users and the providers of genetic material.

95. (A) Invasive species outcompeting native flora and reducing fodder
Lantana camara is a non-native invasive plant species that has spread aggressively across many Indian forests. It represents a major ecological issue because it outcompetes native flora for sunlight and nutrients, often forming dense thickets that prevent the growth of local plants. This reduces the availability of fodder for herbivores and degrades the overall health and biodiversity of the forest ecosystem.

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covers variations within a species. This is followed by species diversity, referring to the variety of species in a region. The broadest scale is ecosystem diversity, which encompasses the different habitats and ecological processes across a larger landscape or biome.

44. (D) It must have 1500 endemic vascular plants and 70% habitat loss
Biodiversity hotspots are regions with high conservation priority based on specific scientific criteria. To be designated as a hotspot, a region must harbor at least 1,500 species of endemic vascular plants found nowhere else on Earth. Additionally, the area must have lost at least 70 percent of its original primary habitat. These strict criteria focus on both unique wealth and threat levels.

45. (C) Eastern Madhya Pradesh (Mandla, Dindori) - Dominant Sal Forests
Forest types in Madhya Pradesh are distributed according to regional rainfall and soil conditions. Eastern districts like Mandla, Dindori, and Balaghat receive higher rainfall, supporting the growth of dominant Sal forests. In contrast, the southern and central regions are known for Teak, while northern areas often feature thorn forests. Therefore, matching Sal forests with the eastern districts is the accurate geographical fact.

46. (B) The maximum species population size an environment can sustain indefinitely
Carrying capacity is a fundamental ecological concept that refers to the maximum population size of a species that a specific environment can sustain indefinitely. This limit is determined by the availability of essential resources like food, water, and habitat space. When a population reaches this level, the growth rate typically slows down and stabilizes as environmental resistance begins to balance birth rates.

47. (C) Statement I is true and Statement II is false
Tropical moist deciduous forests require higher annual rainfall than dry deciduous forests to thrive. These forests are characterized by trees that shed their leaves during the dry summer season to conserve water, not during the monsoon season. Statement I is therefore correct regarding the moisture requirements, while Statement II is false because the leaf-shedding period typically occurs before the arrival of rains.

48. (B) 1, 3, 2, 5, 4
Primary succession on bare rock follows a predictable chronological order as soil develops. It begins with bare rock, followed by the arrival of lichens, which act as pioneer species. Mosses then establish themselves on the thin soil layer created. These are followed by herbaceous plants as the soil thickens. Finally, large trees colonize the area once the environment can support their complex root systems.

49. (A) The variety of habitats, biotic communities, and ecological processes functioning in a region
Ecosystem diversity specifically refers to the variety of different habitats, biotic communities, and ecological processes within a given region. It encompasses the diverse ways in which living organisms interact with their physical environment across various landscapes like forests, wetlands, and deserts. This level of diversity is broader than species or genetic diversity as it looks at the entire ecological system as a whole.

50. (C) Tropics have more solar energy and stable, predictable climates
Tropical regions generally exhibit greater biodiversity because they have remained climatically stable for millions of years, allowing species more time to evolve. Additionally, these areas receive more solar energy throughout the year and experience predictable seasonal patterns without harsh winters. These factors contribute to higher primary productivity and specialized niches, which together support a much wider variety of plant and animal species.

51. (D) Mangrove Tidal Forests
Madhya Pradesh is an inland state dominated by tropical forest types. Its major recognized categories include Tropical Moist Deciduous, Tropical Dry Deciduous, and Tropical Thorn forests. Mangrove tidal forests are coastal ecosystems that grow in saline water and are found along the sea coasts. Since Madhya Pradesh is landlocked and lacks a coastline, mangrove forests do not naturally occur within its borders.

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52. (D) Resources will become depleted, leading to a population crash
When a population significantly exceeds the carrying capacity of its environment, it places unsustainable pressure on local resources. This overshoot leads to the rapid depletion of food, water, and space. As the environment can no longer support the large number of individuals, competition intensifies and mortality rates rise sharply. This usually results in a sudden and dramatic population crash until the size stabilizes.

53. (B) P-4, Q-3, R-1, S-2
Biodiversity concepts are linked to specific geographical regions and definitions. The Western Ghats is a hotspot famous for amphibian diversity. The Indo-Burma region is another hotspot located along India's eastern frontiers. India's megadiverse status is a global recognition of its vast biological wealth. Endemic species are those restricted to a specific area. Matching these correctly provides a clear picture of India's ecological landscape.

54. (D) P-4, Q-3, R-2, S-1
Tree species in Madhya Pradesh have distinct ecological and economic roles. Teak is the premium timber of the central and southern forests. Sal dominates the eastern moist deciduous forests. Bamboo is a fast-growing grass used in rural livelihoods and industry. Mahua is a major non-timber forest product vital for tribal food and beverages. Correctly matching these species highlights their significance to the state.

55. (A) The severe decline and extinction of native biodiversity
Habitat loss and fragmentation occur when large, continuous areas of habitat are destroyed or broken into smaller, isolated patches. This is universally recognized as the leading cause of the severe decline and extinction of native biodiversity. Small fragments cannot support large populations or wide-ranging species, leading to increased vulnerability to disease, predators, and genetic isolation, which ultimately drives many species toward extinction.

56. (D) (A) is false but (R) is true.
Exponential growth occurs when resources are unlimited, but in nature, resources are always finite. This means no population can grow exponentially forever without eventually encountering ecological limits. Carrying capacity is the maximum population size that an ecosystem can sustain based on these available resources. Therefore, the assertion is false because limits always exist, while the reason correctly defines the concept of capacity.

57. (A) It provides raw material for paper and crafts, supporting tribal livelihoods
Bamboo forests in Madhya Pradesh hold significant economic importance, particularly for rural and tribal communities. Bamboo is a versatile, fast-growing resource used as raw material for making paper, traditional crafts, and housing materials. This supports local livelihoods by providing both income and essential resources for daily life. Unlike hardwoods used for luxury furniture, bamboo's value lies in its rapid growth and utility.

58. (A) Both Statement I and Statement II are correct
Biodiversity is categorized into levels that reflect biological organization. Genetic biodiversity specifically addresses the variation of genes within a single species, which is crucial for adaptation. Ecosystem biodiversity refers to the variety of different habitats, communities, and ecological processes within a region. Both statements accurately describe these fundamental concepts, which together help scientists measure and conserve the variety of life on Earth.

59. (A) I, II and IV only
Madhya Pradesh holds the largest total forest cover area among all Indian states. Bamboo is an economically vital non-timber forest product across the state. Teak is primarily found in the tropical dry deciduous forests rather than moist ones, and Sal forests are definitely present in the eastern districts. Therefore, statements I, II and IV are correct, while statement III contains a factual error regarding the forest type for teak.

60. (A) I and III only
India is recognized globally as one of the 17 megadiverse countries, reflecting its immense biological wealth. The Western Ghats are a major biodiversity hotspot known for high species endemism. However, the Indo-Burma hotspot includes the northeastern states of India, rather

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than excluding them. Thus, statements I and III are correct, while statement II is factually incorrect regarding the extent of the hotspot.

61. (A) 2, 3, 4, 1
Environmental legislation in India has evolved over decades. The Wildlife Protection Act was enacted in 1972, followed by the launch of Project Tiger in 1973. The Biological Diversity Act was passed much later in 2002. Finally, the Forest Rights Act was enacted in 2006. This sequence reflects the progressive legal efforts by the government to protect wildlife, habitats, and the rights of people.

62. (A) Gharials would collapse due to nesting site loss and net entanglement
The National Chambal Sanctuary is a specialized protected area for aquatic wildlife. If protection measures were removed, the most immediate consequence would be the collapse of the Gharial population. These reptiles depend on undisturbed sandbanks for nesting and basking. Without protection, habitat destruction and entanglement in illegal fishing nets would rapidly decimate their numbers, as they are highly sensitive to human disturbances.

63. (B) P-4, Q-2, R-3, S-1
National Parks in Madhya Pradesh have unique flagship species and features. Kanha is famous for the Hard Ground Barasingha. The National Chambal Sanctuary is dedicated to Gharials and Dolphins. Panna is known for its successful tiger reintroduction and the Ken River. Satpura features rugged terrain and the high peak of Dhoopgarh. Matching these parks with their specific features defines their conservation importance.

64. (C) Nilgiri Biosphere Reserve
Pachmarhi, Panna, and Achanakmar-Amarkantak are all officially recognized Biosphere Reserves located within the state of Madhya Pradesh. The Nilgiri Biosphere Reserve is a significant protected area, but it is located in southern India, spanning parts of Tamil Nadu, Kerala, and Karnataka. Because the Nilgiri reserve is not in Madhya Pradesh like the others, it serves as the odd one out.

65. (A) Gharial
The National Chambal Sanctuary was established as a tri-state protected area specifically to conserve the Gharial, a critically endangered fish-eating crocodile. The sanctuary protects the deep, clear waters and sandbanks of the Chambal River, which are essential for the survival and breeding of this unique species. While other wildlife exists there, the Gharial is the primary focal point of the sanctuary's mission.

66. (A) Exploitation Zone
Biosphere Reserves are structured into three distinct zones to balance conservation and human use. The core zone is strictly protected for biodiversity. The buffer zone surrounds the core and allows limited research and education. The transition zone allows sustainable human activities and settlements. There is no officially recognized "Exploitation Zone," as the purpose of these reserves is sustainable management rather than unchecked exploitation.

67. (A) I, II, III and V only
Madhya Pradesh's national parks have diverse characteristics. Kanha protects the Barasingha, Bandhavgarh has high tiger density, and Pench is shared with Maharashtra. Panna successfully reintroduced tigers. However, Satpura National Park is actually famous for its very rugged terrain and deep gorges rather than being devoid of them. Therefore, statements I, II, III, and V are correct while statement IV is false.

68. (A) Both Statement I and Statement II are correct
The Hard Ground Barasingha is a unique subspecies found in Kanha National Park that has adapted to grassland environments rather than wetlands. Both statements are accurate because the survival of this species depended on specialized management, including the creation of grass enclosures to protect fawns and restore habitat. These efforts successfully brought the population back from the brink of extinction in Madhya Pradesh.

69. (A) Madhya Pradesh has no officially recognized Ramsar sites within its borders
Ramsar sites are wetlands of international importance. Madhya Pradesh has several such sites, including the Bhoj Wetland in Bhopal, Sakhya Sagar in Madhav National Park, and

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considered timber, they are the odd choice in this specific category.

35. (B) 2.4 percent
India is classified as a megadiverse nation because it hosts a significant portion of the world's biodiversity. Despite supporting nearly eight percent of global species diversity, India possesses only about 2.4 percent of the world's total land area. This highlights the incredible density and variety of life forms found within the country's diverse range of ecosystems, from mountains to coasts.

36. (A) Shade-loving plants will perish while sun-loving weeds proliferate
In a dense forest, the canopy regulates light penetration to the forest floor. If the canopy is removed, the undergrowth experiences a sudden increase in direct solar radiation. Shade-loving plants, which are adapted to low light, will likely perish under these harsh conditions. Meanwhile, sun-loving weeds and opportunistic species will proliferate rapidly, fundamentally altering the composition of the local forest undergrowth.

37. (A) I, II, III and V only
Succession involves predictable changes in an ecosystem over time. Primary succession starts on bare surfaces, while secondary succession is faster due to existing soil. Lichens are classic pioneers on rock, and the entire sequence is called a sere. However, a climax community is defined by its stability rather than instability. Thus, statements I, II, III, and V are ecologically accurate facts.

38. (D) Beta diversity - Species diversity between two distinct communities
Biodiversity is measured at various scales to understand species distribution. Alpha diversity refers to diversity within a single local community. Beta diversity describes the variation in species composition between two different communities or ecosystems. Gamma diversity represents the total diversity over a large geographic region. The pair identifying beta diversity as the difference between two distinct communities is the correct ecological match.

39. (D) Teak (Tectona grandis)
Teak, scientifically known as Tectona grandis, is the most prominent and valuable timber species found in Madhya Pradesh. It dominates the southern and central forest circles, particularly in districts like Hoshangabad and Betul. This species is highly prized for its durable wood and is a major component of the tropical deciduous forests that characterize much of the state's forest landscape.

40. (D) Forest fire clearing vegetation but leaving the soil intact
Secondary succession occurs in areas where a biological community previously existed but was disturbed. Unlike primary succession, the soil remains intact after the disturbance. A forest fire is a common trigger because it removes the existing vegetation while leaving the nutrient-rich soil behind. This allows new plants to colonize the area much more quickly than they would on bare rock or ice.

41. (B) Accelerated topsoil erosion and increased siltation in major reservoirs
Catchment areas are critical for managing the flow and quality of river water. If extensive deforestation occurs, the protective vegetation cover is lost, exposing the soil to heavy rain. This directly leads to accelerated topsoil erosion and increased siltation in downstream reservoirs. Over time, this reduces the water storage capacity of dams and negatively impacts the entire riverine ecosystem and agriculture.

42. (C) Relative stability and self-perpetuation
A climax community represents the final, stable stage of ecological succession. Unlike earlier stages, it remains in equilibrium with the local climate and environment. Its primary characteristics include relative stability, high biomass, and the ability to self-perpetuate. This community will persist indefinitely unless a major external disturbance occurs, making it the most complex and balanced phase of development in an ecosystem.

43. (D) Genetic diversity → Species diversity → Ecosystem diversity
Biological diversity is organized into a hierarchy based on the scale of biological organization. The narrowest scale is genetic diversity, which

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in the Vindhya hills and contains the ruins of the ancient Bandhavgarh Fort within its core area. This combination of rich history and abundant wildlife makes it a unique protected area.

79. (B) Maintaining the grassy meadows essential for Barasingha survival
Controlled burning is a management strategy used in Kanha National Park to maintain the health of its expansive grassy meadows, known as 'maidans'. This practice prevents the encroachment of woody trees into the meadows and promotes the growth of fresh, nutritious grass. These open grasslands are essential for the survival of the Hard Ground Barasingha and other herbivores that rely on them.

80. (D) Illegal sand mining destroying riverbank nesting and basking sites
The decline of Gharials in the Chambal River is heavily linked to illegal sand mining. Gharials require undisturbed sandbanks along the river for basking and for nesting their eggs. Illegal mining activities destroy these critical habitats and increase human disturbance. This direct destruction of their breeding and resting sites significantly reduces their reproductive success and threatens the overall survival of the population.

81. (C) A legally protected ecosystem for conserving biological diversity
The core zone of a Biosphere Reserve is designed to be a strictly protected area where human interference is kept to an absolute minimum. Its primary function is to provide a legally protected ecosystem for the conservation of biological diversity and natural processes. Activities like mining, large-scale tourism, or intensive agriculture are prohibited here to ensure that the wildlife and habitat remain undisturbed.

82. (A) Madhav National Park
While Madhya Pradesh has several National Parks that also function as Tiger Reserves under Project Tiger, not all of them hold this status. Sanjay-Dubri, Bandhavgarh, and Satpura are all officially designated Tiger Reserves. Madhav National Park, although a protected area with significant wildlife and history, is not part of the Project Tiger program. It is primarily managed as a national park.

83. (D) It is exclusively endemic to the Kanha Tiger Reserve landscape
The Hard Ground Barasingha is a subspecies of swamp deer that is uniquely adapted to the grassland environment of central India. It is not found across the entire state and is not a migratory species from other regions. Instead, it is exclusively endemic to the landscape of Kanha Tiger Reserve. This means it exists naturally only in this specific geographic area in Madhya Pradesh.

84. (C) Son River - Son Gharial Sanctuary
Identifying the correct association between rivers and sanctuaries is essential for understanding regional conservation. The Son Gharial Sanctuary is specifically located along the Son River to protect aquatic species like crocodiles and turtles. Other pairs are incorrect as the Ken River is associated with the Ken Gharial Sanctuary, not Chambal, and the Narmada and Betwa rivers have different associated protected areas or none.

85. (C) Snow Leopard
Madhya Pradesh's forests and rivers host a wide range of wildlife, including the Sloth Bear, Dhole, and Indian Pangolin. However, the Snow Leopard is an alpine species adapted to the high-altitude cold environments of the Himalayas. Since Madhya Pradesh consists of tropical and subtropical plains and hills, it does not provide the cold, mountainous habitat required for the Snow Leopard's survival.

86. (D) It is completely isolated and lacks any tiger corridors connecting it to other reserves
Pench National Park is well-known for its role in literature and its geographic location across Seoni and Chhindwara. It is named after the Pench River. The statement claiming it is completely isolated is incorrect. Pench is actually part of a larger landscape and is connected to other protected areas, including Kanha, through vital wildlife corridors that allow for the movement of tigers.

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87. (B) Eutrophication, leading to algal blooms and oxygen depletion
When unregulated sewage is discharged into water bodies like the Upper Lake of Bhopal, it introduces excessive nutrients like nitrogen and phosphorus. This process, known as

Yashwant Sagar in Indore. Claiming that the state has no officially recognized Ramsar sites is factually incorrect. These wetlands are vital for conserving aquatic biodiversity and supporting migratory birds, as well as providing essential hydrological services.

70. (C) Dandeli Wildlife Sanctuary
Nauradehi, Ratapani, and Bori are all prominent Wildlife Sanctuaries located within the state of Madhya Pradesh. Dandeli Wildlife Sanctuary is a well-known protected area, but it is situated in the state of Karnataka. Since the question asks for an odd one out based on geographic location, Dandeli is the correct choice because it is the only sanctuary not located in Madhya Pradesh.

71. (A) Abundance of giant ferns and endemic Sal and Teak associates
Pachmarhi Biosphere Reserve is known for its unique botanical composition due to its geography and altitude. It features an abundance of giant ferns and a diverse mix of Sal and Teak trees, which is rare because these two species usually dominate different forest types. The presence of these endemic associates and moist deciduous vegetation characterizes the rich flora of the Satpura range.

72. (B) Preventing genetic isolation of tiger populations and facilitating natural dispersal
Wildlife corridors are strips of natural habitat that connect isolated protected areas, such as the Kanha-Pench corridor. Their primary ecological function is to facilitate the natural movement and dispersal of wide-ranging species like tigers. By allowing individuals to move between different populations, these corridors prevent genetic isolation and help maintain the long-term health and stability of the species across the landscape.

73. (D) It has rich riparian vegetation and diverse tropical deciduous forests
The Narmada River, flowing through its ancient rift valley, supports a rich and diverse ecosystem along its banks. The surrounding landscape is characterized by lush riparian vegetation and extensive tropical deciduous forests. These areas provide vital habitats for a variety of native mammalian wildlife and birds. Unlike coastal rivers, it lacks mangroves, and unlike high-altitude rivers, it is not part of a desert.

74. (C) Madhya Pradesh has the highest leopard population, the 'Leopard State'
Madhya Pradesh has earned the title of "Leopard State" because it hosts the highest population of leopards in India according to national census reports. These adaptable carnivores are found across a wide range of habitats in the state, from dense forests to agricultural lands. They are protected under Schedule I of the Wildlife Protection Act, ensuring their legal conservation and prohibiting their hunting.

75. (D) It highlights the site's role in hydro-ecology, birds, and crocodiles
Designating a site like Sakhya Sagar as a Ramsar wetland highlights its international importance for biodiversity and hydrology. This status emphasizes the wetland's role in supporting aquatic life, including diverse bird populations and crocodiles. It encourages international cooperation for the conservation of the site's unique ecological functions, ensuring that its water quality and habitat are managed sustainably for the benefit of wildlife.

76. (D) Kanha National Park
Project Tiger was launched in 1973 to protect the Bengal tiger and its habitat. Kanha National Park was the first sanctuary in Madhya Pradesh to be brought under this national conservation initiative. Since its inclusion, the park has become a model for successful tiger management and habitat restoration, helping to stabilize and increase the tiger population within the state's forest systems.

77. (C) Statement I is true and Statement II is false
The Pachmarhi Biosphere Reserve is located in the Satpura Range of Madhya Pradesh, which is a terrestrial mountain environment. While statement I correctly identifies its location, statement II is false because the reserve is dedicated to terrestrial forest biodiversity rather than marine corals. Corals are found in marine environments, not in the inland forests and hills of central India like Pachmarhi.

78. (A) Both Statement I and Statement II are correct
Bandhavgarh National Park is famous for its high concentration of Bengal tigers, which has historically been one of the highest in the country. Both statements are correct as the park is situated

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96. (B) A treaty for biodiversity conservation and fair benefit sharing
The Convention on Biological Diversity is an international treaty that was opened for signature at the Earth Summit in 1992. It has three main goals: the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits from genetic resources. Unlike agreements focused on a single species, it covers all aspects of global biodiversity.

97. (A) Processes like climate regulation, water purification, and pollination
Ecosystem services are the benefits that humans receive from nature. Regulating services are those that help maintain environmental stability. This includes processes such as climate regulation through carbon storage, the purification of water by wetlands, and the pollination of crops by insects. These services act as natural regulators that keep the environment healthy and functional, though they are often taken for granted.

98. (C) Forest Rights Act - 2006
Matching environmental laws with their correct enactment years is essential for understanding legal history. The Forest Rights Act was passed in 2006. The Biological Diversity Act was enacted in 2002, not 1972. The Forest Conservation Act was passed in 1980, not 2002. The Wildlife Protection Act was enacted in 1972, not 1986. Therefore, the pair for the Forest Rights Act is correct.

99. (D) It grants tribal communities sovereign control over national parks
The Forest Rights Act recognizes the historical rights of tribal communities and other forest dwellers, including their right to collect minor forest produce and live on forest land. While it empowers these communities to participate in conservation, it does not grant them sovereign control over national parks. These protected areas remain under the legal jurisdiction and management of the state forest departments.

100. (D) Carbon sequestration by a growing forest
Provisioning services are the material goods directly harvested from ecosystems, such as food, timber, and medicinal plants. Collecting Tendu leaves, harvesting bamboo, and extracting medicinal plants all involve the direct removal of resources. Carbon sequestration is classified as a regulating service because it is an environmental process that helps regulate the climate rather than a product that is physically harvested.

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32. The legal doctrine that establishes that those who produce pollution should bear the costs of managing it to prevent damage to human health or the environment is known as:
(A) Precautionary Principle
(B) Polluter Pays Principle
(C) Public Trust Doctrine
(D) Principle of Absolute Liability

33. The Swachh Bharat Mission (Urban) places a strong emphasis on which of the following aspects of Solid Waste Management?
(A) Intentional burying of all municipal waste in unlined landfill sites.
(B) Source segregation of waste into biodegradable and non-biodegradable categories.
(C) Systematic incineration of all wet waste without heat or energy recovery.
(D) Exporting collected municipal solid waste to various neighboring states.

34. Which of the following statements regarding the Central Pollution Control Board (CPCB) is correct?
(A) Establishment under the Air (Prevention and Control of Pollution) Act, 1981.
(B) Direct administrative function under the Prime Minister's Office.
(C) Responsibility for municipal solid waste collection in metropolitan cities.
(D) Maintenance of the National Air Quality Monitoring Programme (NAMP).

35. Which of the following statements about Municipal Solid Waste (MSW) management in Indore is incorrect?
(A) Open dumping and burning of waste at the Devguradia site.
(B) Consistent ranking as India's cleanest city in the Swachh Survekshan surveys.
(C) Operation of a large-scale bio-CNG plant utilizing wet municipal waste.
(D) Practice of six-bin source segregation by households within the city.

36. The National Green Tribunal (NGT) has jurisdiction over all civil cases where a substantial question relating to the environment is involved. Which of the following acts is NOT covered under the NGT's jurisdiction?
(A) The Wildlife (Protection) Act, 1972
(B) The Water (Prevention and Control of Pollution) Act, 1974
(C) The Forest (Conservation) Act, 1980
(D) The Environment (Protection) Act, 1986

37. The Bhopal Gas Tragedy was triggered by the introduction of which substance into the MIC storage tank?
(A) Water
(B) Sulfuric acid
(C) Chlorine gas
(D) Ammonia

38. The Narmada Action Plan, aimed at abating pollution in the Narmada River, was significantly catalyzed by the pollution loads from which major urban center?
(A) Ujjain
(B) Gwalior
(C) Sagar
(D) Jabalpur

39. Which of the following is NOT classified as a primary air pollutant?
(A) Sulfur dioxide (SO_2)
(B) Carbon monoxide (CO)
(C) Nitrogen oxide (NO)
(D) Ground-level Ozone (O_3)

40. Consider the following statements regarding the Environment (Protection) Act, 1986:
I. It was enacted in the wake of the Bhopal Gas Tragedy.
II. It acts as an "umbrella" legislation designed to provide a framework for central government coordination.
III. It restricts the central government from setting new national standards for environmental quality.
IV. It defines "environment" to include water, air, land, and their inter-relationship with human beings.
V. It empowers the central government to establish authorities with the mandate of preventing environmental pollution.
Which combination of the above statements is incorrect?
(A) I and II only
(B) III only
(C) IV and V only

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into the main Chambal channel.
(C) The National Chambal Sanctuary is dedicated to the conservation of the critically endangered Gharial.
(D) Sand mining and illegal fishing pose significant threats to its aquatic ecosystem.

9. Consider the following statements about Thermal Pollution:
I. It decreases the dissolved oxygen capacity of water.
II. It is primarily caused by the discharge of cold water from industrial processes.
III. It can cause thermal shock to aquatic organisms, leading to mass mortality.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

10. Arrange the following Air Quality Index (AQI) categories in increasing order of severity:
I. Very Poor
II. Moderate
III. Severe
IV. Poor
Which of the following sequences is correct?
(A) II, I, IV, III
(B) II, IV, I, III
(C) IV, II, I, III
(D) I, II, IV, III

11. Which of the following is a direct effect of pesticide overuse on agricultural soil?
(A) Sustained increase in populations of beneficial earthworms.
(B) Drastic increase in soil moisture retention and absorption capacity.
(C) Significant reduction in the salinity levels of the topsoil.
(D) Destruction of soil microbiota and loss of soil fertility.

12. Read the following statements and choose the correct option:
Statement I: Indoor air pollution is often more hazardous to human health than outdoor air pollution.
Statement II: Poor ventilation and the use of biomass fuels for cooking trap high levels of pollutants inside rural homes.
(A) Both Statement I and Statement II are correct and Statement II explains Statement I.
(B) Both Statement I and Statement II are correct but Statement II does not explain Statement I.
(C) Statement I is correct but Statement II is incorrect.
(D) Statement I is incorrect but Statement II is correct.

13. Consider the following statements regarding the Bhopal Gas Tragedy:
I. It occurred on the night of December 2-3, 1984.
II. The toxic gas released was Methyl Isocyanate (MIC).
III. The pesticide plant was operated by Union Carbide India Limited.
IV. The tragedy resulted in the immediate passage of the Water Act.
V. Groundwater in the vicinity of the plant remains contaminated with toxic chemicals today.
Which combination of the above statements is incorrect?
(A) I and II only
(B) III and V only
(C) IV only
(D) II, IV, and V only

14. Which scientific parameter is most commonly used to measure the amount of organic pollution in a water body?
(A) Total Dissolved Solids (TDS)
(B) Potential of Hydrogen (pH)
(C) Biochemical Oxygen Demand (BOD)
(D) Dissolved Oxygen (DO) saturation point

15. Match the environmental legislations in List I with their years of enactment in List II.
List I: (Environmental Legislations)
P. Environment (Protection) Act
Q. Air (Prevention and Control of Pollution) Act
R. Water (Prevention and Control of Pollution) Act
S. National Green Tribunal Act
List II: (Year of Enactment)
1. 1974

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2. 1981
3. 1986
4. 2010

(A) P-2, Q-3, R-1, S-4
(B) P-4, Q-2, R-3, S-1
(C) P-3, Q-1, R-2, S-4
(D) P-3, Q-2, R-1, S-4

16. Match the air pollutants in List I with their primary sources in List II.
List I: (Air Pollutants)
P. Sulfur Dioxide (SO_2)
Q. Nitrogen Oxides (NOx)
R. Carbon Monoxide (CO)
S. Chlorofluorocarbons (CFCs)
List II: (Primary Sources)
1. Incomplete combustion of fossil fuels in vehicles
2. Refrigerants and aerosol propellants
3. Thermal power plants burning coal
4. High-temperature combustion in vehicle engines

(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-1, Q-4, R-3, S-2

17. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R):
Assertion (A): Radioactive pollution is highly dangerous even in small quantities.
Reason (R): Radioactive substances emit ionizing radiation that can damage cellular DNA and cause mutations.

(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

18. Which of the following is not a designated statutory function of the Central Pollution Control Board (CPCB)?

(A) Directly issuing environmental clearances for all new mining projects in India.
(B) Advising the Central Government on matters concerning prevention and control of water and air pollution.
(C) Coordinating the activities of the State Pollution Control Boards.
(D) Planning and organizing training of persons engaged in programs for pollution control.

19. Which of the following pairs of soil pollutant and its primary agricultural source is correctly matched?

(A) Organochlorines - Chemical fertilizers
(B) Nitrates - Pesticides
(C) Heavy metals - Organic compost
(D) Phosphates - Synthetic fertilizers

20. Match the waterborne pollutants in List I with the diseases or conditions they cause in List II.
List I: (Waterborne Pollutants)
P. Mercury
Q. Cadmium
R. Nitrates
S. Arsenic
List II: (Diseases/Conditions)
1. Blue Baby Syndrome
2. Blackfoot Disease
3. Minamata Disease
4. Itai-Itai Disease

(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-2, Q-4, R-1, S-3

21. Bioremediation is an effective technique used primarily for resolving which type of pollution?

(A) High levels of noise pollution in congested urban centers.
(B) Thermal pollution in localized cooling water reservoirs.
(C) Soil and groundwater contamination by hydrocarbons.
(D) Indoor air pollution resulting from biomass cooking smoke.

22. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R):
Assertion (A): Extended Producer Responsibility (EPR) policy shifts the financial and physical burden of waste management from local governments back to the producers.
Reason (R): EPR encourages companies to design more environmentally friendly and easily recyclable products.

(A) Both A and R are true and R is the correct

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explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

23. The Water (Prevention and Control of Pollution) Act was enacted in which year to maintain or restore the wholesomeness of water in India?
(A) 1972
(B) 1974
(C) 1981
(D) 1986

24. Read the following statements and choose the correct option:
Statement I: E-waste contains hazardous heavy metals like lead, mercury, and cadmium.
Statement II: Informal processing of e-waste, such as open burning of wires, releases toxic dioxins into the air.
(A) Both Statement I and Statement II are correct.
(B) Statement I is correct but Statement II is incorrect.
(C) Statement I is incorrect but Statement II is correct.
(D) Both Statement I and Statement II are incorrect.

25. Which districts in Madhya Pradesh are most severely affected by fluoride contamination in groundwater?
(A) Indore and Ujjain
(B) Mandla, Seoni, and Jhabua
(C) Gwalior and Bhind
(D) Rewa and Satna

26. Consider the following statements regarding Particulate Matter (PM):
I. PM 2.5 particles are smaller than 2.5 micrometers in diameter.
II. PM 10 particles can bypass the respiratory system's defenses and enter the bloodstream more easily than PM 2.5.
III. Construction activities and unpaved roads are significant sources of PM 10.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

27. Under the Noise Pollution (Regulation and Control) Rules, 2000, what is the permissible ambient noise level limit during the daytime in residential areas?
(A) 75 dB(A)
(B) 65 dB(A)
(C) 55 dB(A)
(D) 45 dB(A)

28. The phenomenon of eutrophication in lakes is primarily caused by which of the following?
(A) Runoff of nitrogen and phosphorus from agricultural fields.
(B) Excessive accumulation of toxic heavy metals from industrial effluents.
(C) Thermal pollution from nearby power plants raising water temperature.
(D) Deposition of radioactive waste materials within the lake bed.

29. What is the chemical formula of Methyl Isocyanate, the gas responsible for the Bhopal Gas Tragedy?
(A) CH_3CN
(B) CH_4N_2O
(C) CH_3NCO
(D) C_2H_5NCO

30. Which of the following pollutants is uniquely known to cause fluorosis when present in excessive amounts in groundwater?
(A) Arsenic
(B) Lead
(C) Mercury
(D) Fluoride

31. Arrange the following steps of Municipal Solid Waste Management in their logical operational sequence:
I. Processing and Treatment
II. Collection
III. Disposal in Landfill
IV. Segregation at Source
Which of the following sequences is correct?
(A) II, IV, I, III
(B) IV, II, I, III
(C) IV, I, II, III
(D) II, I, IV, III

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48. Which of the following statements correctly describes the pollution challenge in the Pithampur industrial belt of Madhya Pradesh?
(A) Excessive noise pollution specifically due to automobile testing tracks.
(B) Improper disposal of hazardous industrial waste and effluent discharge.
(C) Achievement of zero-emission status as a recognized green industrial zone.
(D) Environmental hazards from radioactive waste at nearby nuclear facilities.

49. What is the most appropriate initial treatment for industrial effluents containing heavy metals before discharging them into a water body?
(A) Chemical precipitation of dissolved metals into solid particles.
(B) Immediate dilution with large quantities of fresh surface water.
(C) Biological treatment using aerobic bacteria.
(D) Storing in open ponds to allow for natural solar evaporation.

50. What is the primary environmental consequence of the excessive use of nitrogenous fertilizers in agriculture?
(A) Significant decrease in natural soil acidity levels.
(B) Immediate death of all commercial agricultural crops.
(C) Leaching into groundwater causing nitrate contamination.
(D) Reduction in the emission of nitrous oxide gases.

51. What is the minimum thickness mandated by the Government of India for plastic carry bags to facilitate their collection and recycling, effectively banning thinner single-use bags?
(A) 50 microns
(B) 75 microns
(C) 120 microns
(D) 200 microns

52. Which environmental concept requires manufacturers to take back their products at the end of their useful life for recycling or safe disposal?
(A) Corporate Social Responsibility (CSR)
(B) Polluter Pays Principle
(C) Precautionary Principle
(D) Extended Producer Responsibility (EPR)

53. The Air (Prevention and Control of Pollution) Act was enacted in 1981, but it was amended in 1987 to explicitly include which of the following as an air pollutant?
(A) Carbon dioxide
(B) Water vapor
(C) Noise
(D) Ozone

54. In India, the Air Quality Index (AQI) calculation is based on the measurement of how many core pollutants?
(A) 4
(B) 6
(C) 8
(D) 10

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55. Which of the following is an odd one out among the typical sources of indoor air pollution?
(A) Photochemical smog
(B) Unvented gas stoves
(C) Formaldehyde from pressed wood products
(D) Volatile Organic Compounds (VOCs) from paints

56. Read the following statements and choose the correct option:
Statement I: An individual's carbon footprint represents the total greenhouse gas emissions caused directly and indirectly by their activities.
Statement II: Adopting a plant-based diet and using public transport generally increases an individual's carbon footprint.
(A) Both Statement I and Statement II are correct.
(B) Statement I is correct but Statement II is incorrect.
(C) Statement I is incorrect but Statement II is correct.
(D) Both Statement I and Statement II are incorrect.

57. What is the primary environmental impact of plastic pollution in riverine ecosystems like the Narmada and Chambal?
(A) Ingestion of microplastics by aquatic fauna causing internal blockages.
(B) Significant increase in the dissolved oxygen levels in the water.

(D) II, III, and V only

41. Identify the incorrect pair regarding types of pollution and their standard unit of measurement.
(A) Noise Pollution - Decibels (dB)
(B) Water Turbidity - Parts per million of Carbon (ppmC)
(C) Radioactive Pollution - Sieverts (Sv)
(D) Particulate Matter - Micrograms per cubic meter ($\mu g/m^3$)

42. Match the institutions in List I with their core mandates in List II.
List I: (Institutions)
P. National Green Tribunal (NGT)
Q. Central Pollution Control Board (CPCB)
R. Ministry of Environment, Forest and Climate Change
S. Municipal Corporation
List II: (Core Mandates)
1. Apex policy-making body for environment at the central level
2. Speedy disposal of cases relating to environmental protection
3. Collection and disposal of municipal solid waste
4. Setting national ambient air quality standards
(A) P-4, Q-2, R-1, S-3
(B) P-2, Q-1, R-4, S-3
(C) P-2, Q-4, R-1, S-3
(D) P-1, Q-4, R-2, S-3

43. Read the following statements and choose the correct option:
Statement I: Prolonged exposure to high levels of noise pollution can lead to hypertension and ischemic heart disease.
Statement II: Noise pollution affects only the auditory system and has no physiological impact on the cardiovascular system.
(A) Both Statement I and Statement II are correct.
(B) Statement I is correct but Statement II is incorrect.
(C) Statement I is incorrect but Statement II is correct.
(D) Both Statement I and Statement II are incorrect.

44. The presence of high levels of coliform bacteria in a water body indicates contamination by which of the following?
(A) Industrial heavy metals
(B) Radioactive isotopes
(C) Agricultural pesticides
(D) Human or animal feces

45. Which of the following represents the correct sequence of the 4R concept in solid waste management, from most desirable to least desirable?
(A) Recover, Recycle, Reuse, Refuse
(B) Refuse, Reuse, Recycle, Recover
(C) Reuse, Refuse, Recover, Recycle
(D) Recycle, Recover, Refuse, Reuse

46. Consider the following statements about Plastic Pollution:
I. Microplastics are plastic fragments smaller than 5 millimeters.
II. Single-use plastics constitute a negligible fraction of municipal solid waste.
III. Plastics can act as vectors for chemical pollutants in marine environments.
IV. The burning of PVC plastics releases toxic dioxins and furans.
Which of the above statement(s) is/are correct?
(A) I, II, and III
(B) I, III, and IV
(C) II, III, and IV
(D) I, II, and IV

47. Read the following statements and choose the correct option:
Statement I: The site of the former Union Carbide plant in Bhopal has been completely cleared of all toxic chemical wastes.
Statement II: Long-term environmental contamination in Bhopal continues to affect the soil and groundwater quality in communities adjacent to the plant.
(A) Both Statement I and Statement II are correct.
(B) Statement I is correct but Statement II is incorrect.
(C) Statement I is incorrect but Statement II is correct.
(D) Both Statement I and Statement II are incorrect.

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(C) Smoke and Fog
(D) Soot and Methane

68. Carbon Monoxide (CO) is a dangerous air pollutant because it affects human health primarily by:
(A) Irritating the mucous membranes of the human eyes and nose.
(B) Binding to hemoglobin to reduce oxygen-carrying capacity.
(C) Causing genetic mutations in lung cells leading to cancer.
(D) Inducing severe allergic reactions in the respiratory tract.

69. Read the following statements and choose the correct option:
Statement I: High-level radioactive waste generates significant heat and requires deep geological disposal.
Statement II: Spent nuclear fuel from atomic power stations is considered low-level radioactive waste.
(A) Both Statement I and Statement II are correct.
(B) Statement I is correct but Statement II is incorrect.
(C) Statement I is incorrect but Statement II is correct.
(D) Both Statement I and Statement II are incorrect.

70. Photochemical smog is primarily formed by the reaction of sunlight with which of the following pollutants?
(A) Excessive sulfur dioxide and carbon monoxide emissions.
(B) Atmospheric chlorofluorocarbons and ground-level ozone.
(C) Nitrogen oxides and volatile organic compounds (VOCs).
(D) High levels of particulate matter and gaseous ammonia.

71. Which of the following correctly pairs a bioremediation technique with its description?
(A) Bioventing - Supplying air and nutrients into soil to stimulate indigenous bacteria.
(B) Bioaugmentation - Heating contaminated soil to physically extract volatile chemicals.
(C) Biostimulation - Adding genetically modified plants to absorb atmospheric pollutants.
(D) Composting - Using chemical oxidants to destroy organic contaminants.

72. Which of the following actions is the most effective way for an individual to substantially reduce their carbon footprint?
(A) Switching from old incandescent bulbs to modern LED lighting.
(B) Replacing personal car use with public transport or cycling.
(C) Leaving electrical appliances on standby rather than turning them off.
(D) Using paper bags instead of reusable cloth bags for shopping.

73. Which of the following is NOT a major anthropogenic source of Nitrogen Oxides (NOx) pollution?
(A) Exhaust from internal combustion engines in automobiles.
(B) Emissions from thermal power plants burning fossil fuels.
(C) Combustion processes in large-scale industrial boilers.
(D) Decomposition of organic waste in landfills.

74. Read the following statements and choose the correct option:
Statement I: The National Green Tribunal (NGT) is not bound by the procedure laid down under the Code of Civil Procedure, 1908.
Statement II: The NGT is guided by the principles of natural justice.
(A) Both Statement I and Statement II are correct.
(B) Statement I is correct but Statement II is incorrect.
(C) Statement I is incorrect but Statement II is correct.
(D) Both Statement I and Statement II are incorrect.

75. The main objective of the Air (Prevention and Control of Pollution) Act, 1981 is to:
(A) Promoting the expansion of commercial aviation infrastructure.
(B) Regulating indoor air temperatures in commercial buildings.
(C) Establishing a global carbon trading and

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(C) Rapid decomposition releasing nutrients that cause eutrophication.
(D) Neutralization of acidic agricultural runoff entering the river.

58. Which of the following items is typically exempted from India's nationwide ban on single-use plastics implemented in 2022?
(A) Compostable plastic carry bags
(B) Plastic flags
(C) Polystyrene (Thermocol) for decoration
(D) Plastic sticks for balloons

59. Match the thermal power plants in List I with their respective locations in Madhya Pradesh in List II.
List I: (Thermal Power Plants)
P. Vindhyachal Super Thermal Power Station
Q. Satpura Thermal Power Station
R. Sanjay Gandhi Thermal Power Station
S. Shri Singaji Thermal Power Project
List II: (Locations)
1. Khandwa
2. Singrauli
3. Umaria
4. Betul
(A) P-4, Q-2, R-1, S-3
(B) P-2, Q-3, R-4, S-1
(C) P-2, Q-4, R-3, S-1
(D) P-1, Q-4, R-3, S-2

60. Which of the following pairs of heavy metals found in e-waste and their primary source component is correctly matched?
(A) Mercury - Copper wiring
(B) Lead - Cathode Ray Tube (CRT) glass
(C) Cadmium - Plastic casings
(D) Arsenic - Lithium-ion batteries

61. Which of the following waste materials is NOT generally considered biodegradable?
(A) Vegetable peels
(B) Cotton rags
(C) E-waste circuit boards
(D) Paper waste

62. Identify the incorrect pair regarding pollution monitoring and control in India.
(A) AQI - Water quality measurement tool
(B) CPCB - Central nodal agency for pollution control
(C) NEERI - National Environmental Engineering Research Institute
(D) NGT - Environmental dispute adjudication

63. Read the following statements and choose the correct option:
Statement I: Excessive fluoride in drinking water initially causes dental fluorosis, characterized by staining and pitting of teeth.
Statement II: Skeletal fluorosis is a severe condition resulting from long-term exposure to high levels of fluoride, causing joint stiffness and bone deformities.
(A) Both Statement I and Statement II are correct.
(B) Statement I is correct but Statement II is incorrect.
(C) Statement I is incorrect but Statement II is correct.
(D) Both Statement I and Statement II are incorrect.

64. Which of the following gases is an odd one out as it is primarily recognized for its role in stratospheric ozone depletion rather than acting as a localized urban air pollutant?
(A) Nitrogen dioxide (NO_2)
(B) Sulfur dioxide (SO_2)
(C) Chlorofluorocarbons (CFCs)
(D) Carbon monoxide (CO)

65. Which of the following is an odd one out when classifying the primary sources of soil pollution?
(A) High decibel noise from commercial airports
(B) Excessive use of synthetic pesticides
(C) Improper disposal of industrial solid waste
(D) Spills of petroleum hydrocarbons

66. Which of the following is NOT one of the six categories of the Air Quality Index (AQI) used in India?
(A) Good
(B) Satisfactory
(C) Hazardous
(D) Severe

67. Smog, a major air pollution challenge in urban centers, is fundamentally a combination of which two components?
(A) Snow and Fog
(B) Sulfur and Ozone

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CHAPTER 11
Pollution and Its Types

1. What does an Air Quality Index (AQI) value of 250 signify regarding health impacts?
(A) Good air quality with little to no detectable health risk to the population.
(B) Moderate air quality affecting only highly sensitive groups in the population.
(C) Poor quality causing breathing discomfort on prolonged exposure.
(D) Severe air quality causing respiratory effects even in healthy individuals.

2. Which of the following is the correct order of the waste management hierarchy from most preferred to least preferred?
(A) Recycle, Reuse, Reduce, Disposal
(B) Reduce, Reuse, Recycle, Disposal
(C) Disposal, Recycle, Reuse, Reduce
(D) Reuse, Reduce, Disposal, Recycle

3. In which year was the Madhya Pradesh Pollution Control Board (MPPCB) established under the Water (Prevention and Control of Pollution) Act?
(A) 1972
(B) 1974
(C) 1981
(D) 1986

4. Which of the following best defines phytoremediation?
(A) Use of specialized microorganisms to degrade harmful environmental pollutants.
(B) Physical removal of contaminated topsoil using heavy industrial machinery.
(C) Use of plants to absorb and detoxify contaminants from soil and water.
(D) Chemical neutralization of acidic soils using agricultural lime products.

5. Consider the following statements regarding the Narmada River's pollution challenges:
I. Untreated sewage from cities like Jabalpur and Hoshangabad contributes to its pollution.
II. Agricultural runoff rich in fertilizers has led to localized eutrophication.
III. Illegal sand mining on its banks has altered the riverbed ecology.
IV. The Narmada Action Plan was exclusively funded by the World Bank.
Which combination of the above statements is correct?
(A) I, II, and III only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, III, and IV only

6. Which of the following pairs of Madhya Pradesh cities and their associated prominent pollution challenge is incorrectly matched?
(A) Bhopal - Legacy toxic waste from the 1984 gas tragedy
(B) Indore - Highest levels of radioactive pollution in the state
(C) Pithampur - Industrial effluent and air pollution
(D) Singrauli - Coal dust and thermal power plant emissions

7. Which of the following best defines environmental pollution?
(A) The natural degradation of forest ecosystems over time due to climate variations.
(B) Introduction of harmful contaminants into the natural environment causing adverse change.
(C) Excessive depletion of groundwater resources caused by intensive agricultural practices.
(D) Natural biological evolution of species in response to changing weather patterns.

8. Identify the incorrect statement regarding the Chambal River.
(A) Status as one of the least polluted major river systems in India.
(B) Direct industrial pollution from Pithampur

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credit mechanism.
(D) Prevention, control, and abatement of air pollution.

76. Which of the following correctly describes a major threat to the Gharial population in the Chambal river?
(A) Thermal pollution from offshore oil drilling operations.
(B) Acid rain caused by local volcanic activity in the area.
(C) Extreme salinity increases due to seawater intrusion events.
(D) Loss of nesting sandbanks due to illegal sand mining.

77. Chronic exposure to arsenic through contaminated groundwater is most closely associated with which health impact?
(A) Minamata disease
(B) Methemoglobinemia (Blue baby syndrome)
(C) Itai-itai disease
(D) Skin lesions and Blackfoot disease

78. Identify the incorrect statement regarding the E-Waste (Management) Rules in India.
(A) Application to manufacturers and consumers involved in e-waste processing.
(B) Implementation of Extended Producer Responsibility (EPR) as a key feature.
(C) Minimization of illegal recycling that leads to heavy metal contamination.
(D) Recognition of informal kabadiwalas as primary recyclers.

79. Which of the following statements about Extended Producer Responsibility (EPR) in India is correct?
(A) It applies only to the agricultural sector for fertilizer management.
(B) Mandatory management of end-of-life disposal for plastics and e-waste.
(C) It provides government subsidies to producers who generate the most waste.
(D) It shifts the responsibility of recycling entirely onto individual consumers.

80. Who was the Chairman of Union Carbide Corporation at the time of the Bhopal Gas Tragedy in 1984?
(A) John Browne
(B) Kenneth Lay
(C) Andrew Liveris
(D) Warren Anderson

81. Identify the incorrect statement regarding municipal solid waste processing in major Madhya Pradesh cities.
(A) Bioremediation of legacy waste has been successfully executed at the Bhanpur dumpsite in Bhopal.
(B) Jabalpur hosts a Waste-to-Energy (WtE) plant that generates electricity from municipal solid waste.
(C) Indore relies entirely on unscientific open dumping without any mechanical processing of waste.
(D) Composting and biomethanation are widely promoted for wet waste management across MP cities.

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82. Where is the headquarters of the Madhya Pradesh Pollution Control Board (MPPCB) located?
(A) Bhopal
(B) Indore
(C) Jabalpur
(D) Gwalior

83. The legal and policy aftermath of the Bhopal Gas Tragedy directly resulted in the formulation of which principle by the Indian Supreme Court to hold hazardous industries strictly accountable?
(A) The Doctrine of Eminent Domain
(B) The Precautionary Principle
(C) The Public Trust Doctrine
(D) The Principle of Absolute Liability

84. The Water (Prevention and Control of Pollution) Cess Act was introduced in 1977 primarily to:
(A) Banning the use of groundwater for all industrial purposes.
(B) Providing free water treatment facilities to agricultural farmers.
(C) Augment financial resources of Pollution Control Boards.
(D) Establishing a separate national court system for water disputes.

85. What is the best description of the primary focus of the Swachh Bharat Mission 2.0 regarding municipal solid waste?

53. (C) Noise
Originally enacted in 1981 to address atmospheric pollution, the Air Act was significantly amended in 1987. This amendment expanded the legal definition of air pollutants to explicitly include noise. This change recognized that excessive sound levels constitute a form of environmental pollution that impacts human health and well-being, allowing regulatory bodies to set and enforce standards for ambient noise levels.

54. (C) 8
India's National Air Quality Index is calculated based on the concentrations of eight core pollutants. These include particulate matter (PM 10 and PM 2.5), nitrogen dioxide, sulfur dioxide, carbon monoxide, ground-level ozone, ammonia, and lead. By monitoring this specific set of pollutants, the index provides a comprehensive and easy-to-understand representation of air quality and its potential health implications.

55. (A) Photochemical smog
Indoor air pollution is characterized by contaminants that accumulate within enclosed structures. Sources include gas stoves, wood products releasing formaldehyde, and paints emitting volatile organic compounds. Photochemical smog, however, is an outdoor atmospheric phenomenon formed by sunlight reacting with pollutants like nitrogen oxides. It is not typically generated indoors, although it can infiltrate buildings from the outside environment.

56. (B) Statement I is correct but Statement II is incorrect.
A carbon footprint measures the total greenhouse gas emissions associated with an individual's lifestyle and choices. Adopting a plant-based diet and utilizing public transportation are effective ways to decrease this footprint because they are generally less energy-intensive than meat production and personal car use. Therefore, the claim that these environmental actions would increase an individual's carbon footprint is incorrect.

57. (A) Ingestion of microplastics by aquatic fauna causing internal blockages.
In riverine ecosystems, plastic waste eventually breaks down into microplastics. These small particles are frequently ingested by fish and other aquatic fauna, leading to internal physical blockages, reduced feeding, and potential chemical toxicity. Unlike organic matter, plastics do not decompose to release nutrients and do not increase dissolved oxygen. Instead, they represent a persistent physical and chemical threat to health.

58. (A) Compostable plastic carry bags
In 2022, India implemented a nationwide ban on several single-use plastic items, such as plastic flags, thermocol decorations, and balloon sticks. However, compostable plastic carry bags are typically exempted from such bans. These materials are designed to break down into organic matter under specific composting conditions, offering a more sustainable alternative to traditional petroleum-based plastics that persist for centuries.

59. (C) P-2, Q-4, R-3, S-1
Madhya Pradesh has several major thermal power stations located near coal sources. The Vindhyachal plant is in Singrauli, while the Satpura station is located in Betul. The Sanjay Gandhi plant is situated in Umaria, and the Shri Singaji project is in Khandwa. These facilities are essential for energy production but also require environmental monitoring for air and water pollution.

60. (B) Lead - Cathode Ray Tube (CRT) glass
Electronic components contain various heavy metals that require careful handling during disposal. Lead is predominantly found in the glass of older Cathode Ray Tube monitors and televisions. Mercury is often present in switches and backlights, while cadmium is used in certain types of rechargeable batteries and circuit board coatings. Correctly identifying these sources is vital for safe e-waste recycling.

61. (C) E-waste circuit boards
Biodegradable materials, such as vegetable peels, cotton rags, and paper, can be broken down by microorganisms into natural substances. Electronic waste components like circuit boards are composed of metals, glass, and synthetic plastics that are non-biodegradable. These materials persist in the environment for extremely long periods and can leach hazardous

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95. Which of the following is an odd one out regarding the major sources of indoor air pollution in rural India?
(A) Solar cookers
(B) Cow dung cakes
(C) Firewood
(D) Crop residue

96. Read the following statements and choose the correct option:
Statement I: The success of Indore's solid waste management model relies heavily on 100% door-to-door collection and source segregation.
Statement II: Spot fines for littering and strong public participation played no role in Indore's cleanliness ranking.
(A) Both Statement I and Statement II are correct.
(B) Statement I is correct but Statement II is incorrect.
(C) Statement I is incorrect but Statement II is correct.
(D) Both Statement I and Statement II are incorrect.

97. Which of the following represents a "non-point source" of water pollution?
(A) Agricultural runoff carrying fertilizers over a large watershed.
(B) A discharge pipe from a textile factory.
(C) Untreated sewage flowing from a municipal drain into a river.
(D) An oil spill from a single tanker ship.

98. The entry of microplastics into the marine food chain primarily causes:
(A) Enhanced reproductive rates in aquatic marine mammals.
(B) Biomagnification of toxic chemicals in higher predators.
(C) Rapid increase in coral reef calcification processes.
(D) Total eradication of all phytoplankton species in the sea.

99. PM 2.5 is considered highly dangerous to human health primarily because:
(A) Easy dissolution in contaminated drinking water supplies.
(B) Emission of high levels of harmful ionizing radiation.
(C) Causes immediate severe skin burns upon physical contact.
(D) Penetration into alveolar regions and the bloodstream.

100. The concept of minimizing environmental pollution and ensuring the safe management of chemicals and waste is most directly linked to which United Nations Sustainable Development Goal (SDG)?
(A) SDG 4: Universal Access to Quality Education.
(B) SDG 5: Promotion of Global Gender Equality.
(C) SDG 12: Responsible Consumption and Production.
(D) SDG 16: Peace, Justice and Strong Institutions.

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various forms of cancer, and other severe health complications. Consequently, the handling and disposal of radioactive materials require safety protocols.

18. (A) Directly issuing environmental clearances for all new mining projects in India.
The Central Pollution Control Board serves as a technical advisory body to the government and coordinates the activities of state-level boards. Its mandates include setting standards for air and water quality and organizing training programs. However, the authority to issue environmental clearances for mining projects rests with the Ministry of Environment, Forest and Climate Change, not the CPCB.

19. (D) Phosphates - Synthetic fertilizers
Synthetic fertilizers are a primary source of phosphate and nitrate contamination in agricultural soils. While pesticides contribute various organic pollutants, organochlorines are a specific class of pesticides rather than fertilizers. Heavy metals often enter soil through industrial waste or low-quality compost. Understanding these specific links is vital for implementing sustainable farming practices and preventing the long-term degradation of land.

20. (A) P-3, Q-4, R-1, S-2
Contaminated water causes severe health conditions depending on the specific chemical present. Mercury ingestion leads to Minamata disease, while cadmium exposure is linked to Itai-Itai disease. High nitrate levels in drinking water cause Blue Baby Syndrome in infants by affecting oxygen transport. Arsenic contamination is notoriously associated with skin lesions and the development of the dangerous Blackfoot disease.

21. (C) Soil and groundwater contamination by hydrocarbons.
Bioremediation is a specialized waste management technique that employs microorganisms to degrade or neutralize organic contaminants. It is particularly effective for cleaning up soil and groundwater contaminated by petroleum hydrocarbons and other hazardous chemicals. This biological process transforms toxic substances into less harmful products like carbon dioxide and water, providing a cost-effective alternative to physical or chemical cleanup methods.

22. (A) Both A and R are true and R is the correct explanation of A.
Extended Producer Responsibility is a policy approach that holds manufacturers accountable for the entire lifecycle of their products, especially disposal. By shifting the financial burden of waste management from the public sector to the producers, it creates a strong incentive for companies to innovate. This leads to the design of more durable, easily recyclable, and environmentally friendly products.

23. (B) 1974
The Water Prevention and Control of Pollution Act was enacted by the Indian Parliament in 1974. This landmark legislation was designed to maintain and restore the wholesomeness of national water resources. It established the institutional framework for pollution control by creating both Central and State Pollution Control Boards, which are empowered to set standards and regulate discharges.

24. (A) Both Statement I and Statement II are correct.
Electronic waste is hazardous because it contains toxic heavy metals such as lead, mercury, and cadmium within its components. When e-waste is processed through informal methods like open-air burning to recover metals, it releases dangerous chemicals into the environment. This includes toxic dioxins and furans, which pose severe health risks to workers and contribute to significant air pollution.

25. (B) Mandla, Seoni, and Jhabua
Several districts in Madhya Pradesh, including Mandla, Seoni, and Jhabua, face significant public health challenges due to high fluoride concentrations in groundwater. Excessive fluoride consumption leads to dental and skeletal fluorosis among the local population. Managing this issue requires the implementation of community-level defluoridation plants and the provision of alternative safe drinking water sources to prevent long-term disabilities.

26. (C) I and III only
Particulate Matter is categorized by size, with PM 2.5 referring to particles smaller than 2.5

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main Chambal channel. Accurate mapping of industrial discharge is vital.

9. (C) I and III only
Thermal pollution occurs when industrial processes discharge warm water into natural water bodies, which significantly reduces the solubility of dissolved oxygen. This sudden temperature increase can cause lethal thermal shock to aquatic organisms, leading to mass mortality. It is primarily caused by heated wastewater from power plants and factories rather than the discharge of cold water into the environment.

10. (B) II, IV, I, III
The Air Quality Index categories are arranged by increasing severity based on pollutant concentrations and health impacts. Moderate air quality precedes poor conditions, which then escalate to very poor. The most hazardous level is categorized as severe, requiring emergency health precautions for the general population. This structured ranking helps authorities communicate risks effectively and implement necessary environmental mitigation measures.

11. (D) Destruction of soil microbiota and loss of soil fertility.
Excessive application of chemical pesticides in agriculture leads to the destruction of beneficial soil microbiota and essential organisms like earthworms. This loss of biological diversity results in a significant decline in natural soil fertility and disrupts nutrient cycling. Over time, the soil structure degrades, reducing its long-term productivity and increasing dependence on synthetic inputs, which further exacerbates contamination.

12. (A) Both Statement I and Statement II are correct and Statement II explains Statement I.
Indoor air pollution often poses a greater threat to human health than outdoor pollution due to the concentration of contaminants in confined spaces. In rural areas, poor ventilation combined with the burning of biomass fuels for cooking traps high levels of toxic smoke inside homes. This direct exposure to particulate matter and carbon monoxide leads to severe illnesses.

13. (C) IV only
The Bhopal Gas Tragedy involved the release of Methyl Isocyanate from the Union Carbide plant in December 1984. While it remains a major environmental disaster with ongoing groundwater contamination issues, it did not lead to the immediate passage of the Water Act. The Water Act was actually enacted a decade earlier, in 1974, though the tragedy influenced later legislation.

NODIA

14. (C) Biochemical Oxygen Demand (BOD)
Biochemical Oxygen Demand is a critical scientific parameter used to quantify the amount of dissolved oxygen required by aerobic organisms to break down organic material in water. Higher values indicate significant organic pollution, often from sewage or industrial waste. Monitoring these levels is essential for assessing the health of aquatic ecosystems and determining the efficiency of wastewater treatment plants.

15. (D) P-3, Q-2, R-1, S-4
India has enacted several key environmental laws to protect its natural resources. The Water Act was established in 1974, followed by the Air Act in 1981. The Environment Protection Act was introduced in 1986 as an umbrella legislation after the Bhopal disaster. More recently, the National Green Tribunal Act was passed in 2010 to provide specialized environmental justice.

16. (A) P-3, Q-4, R-1, S-2
Air pollutants originate from various human activities. Sulfur dioxide is primarily released from coal-burning power plants, while nitrogen oxides result from high-temperature combustion in vehicle engines. Carbon monoxide is produced during the incomplete combustion of fossil fuels. Chlorofluorocarbons, which contribute to ozone depletion, were widely used as refrigerants and aerosol propellants before international regulations restricted their use.

17. (A) Both A and R are true and R is the correct explanation of A.
Radioactive pollution is exceptionally hazardous because it involves the emission of ionizing radiation. Even in small quantities, these emissions possess enough energy to penetrate living tissues and damage cellular DNA. Such molecular damage can lead to genetic mutations,

open dumping and burning. The city has successfully remediated its legacy waste at the Devguradia site and implemented a robust system of six-bin source segregation. Furthermore, it operates advanced facilities like a large-scale bio-CNG plant that converts organic waste into fuel, contributing to its top ranking.

36. (A) The Wildlife (Protection) Act, 1972
The National Green Tribunal has the authority to hear civil cases related to various environmental laws, including the Water Act, Air Act, and Environment Protection Act. However, cases specifically involving the Wildlife Protection Act of 1972 are currently excluded from its jurisdiction. Such matters are generally handled by the regular criminal court system, highlighting a specific limitation in the tribunal's mandate.

37. (A) Water
The catastrophic release of Methyl Isocyanate in Bhopal was triggered by the accidental entry of water into a large MIC storage tank. This resulted in an exothermic chemical reaction that rapidly increased temperature and pressure within the vessel. The safety systems failed to contain the reaction, leading to the venting of toxic gas into the atmosphere over the city with devastating consequences.

38. (D) Jabalpur
The Narmada Action Plan was developed to address rising pollution levels in Madhya Pradesh's most important river. Major urban centers like Jabalpur were identified as primary contributors due to the discharge of large volumes of untreated domestic sewage and industrial effluents. Targeting these high-load areas is a strategic priority for improving overall river water quality and protecting the downstream ecosystem.

39. (D) Ground-level Ozone (O_3)
Ground-level ozone is classified as a secondary air pollutant because it is not emitted directly from sources like tailpipes or smokestacks. Instead, it forms in the atmosphere through complex chemical reactions between nitrogen oxides and volatile organic compounds in the presence of sunlight. In contrast, sulfur dioxide, carbon monoxide, and nitrogen oxide are primary pollutants released directly into the atmosphere.

40. (B) III only
The Environment Protection Act of 1986 is an umbrella legislation enacted following the Bhopal disaster. It broadly defines the environment and empowers the central government to set national standards and establish regulatory authorities. The statement that it restricts the government from setting new environmental quality standards is incorrect, as providing this power is actually one of the Act's primary objectives.

41. (B) Water Turbidity - Parts per million of Carbon (ppmC)
Environmental parameters are measured using specific standardized units. Noise is measured in decibels, and particulate matter is quantified in micrograms per cubic meter. Radioactive exposure is often measured in Sieverts. However, water turbidity is typically measured in Nephelometric Turbidity Units, while parts per million of carbon is a measure used for organic carbon concentrations, making the turbidity pair incorrect.

42. (C) P-2, Q-4, R-1, S-3
Different organizations have specific roles in India's environmental governance. The Ministry of Environment serves as the apex policy-making body, while the Central Pollution Control Board sets technical standards like those for air quality. The National Green Tribunal provides a specialized judicial forum for environmental cases. At the local level, municipal corporations are responsible for the daily management of solid waste.

43. (B) Statement I is correct but Statement II is incorrect.
Noise pollution has significant physiological effects beyond the auditory system. Prolonged exposure to high decibel levels is a known stressor that can lead to non-auditory health issues such as hypertension, increased stress levels, and ischemic heart disease. Therefore, the claim that it only affects hearing and has no impact on the cardiovascular system is factually and scientifically incorrect.

44. (D) Human or animal feces
The presence of coliform bacteria, specifically E. coli, in a water body is a standard indicator of fecal contamination from human or animal sources.

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micrometers. These fine particles are more dangerous than PM 10 because they can penetrate deeper into the lungs and enter the bloodstream. Significant sources of the larger PM 10 particles include dust from construction activities, unpaved roads, and various industrial processes that generate debris.

27. (C) 55 dB(A)
Under the Noise Pollution Regulation and Control Rules of 2000, the Indian government has established specific ambient noise limits for different zones. In residential areas, the permissible noise level is set at 55 decibels during the daytime to ensure a healthy living environment. These standards are lower during the night to prevent sleep disturbance and other physiological effects.

28. (A) Runoff of nitrogen and phosphorus from agricultural fields.
Eutrophication is the process of nutrient enrichment in water bodies, primarily driven by the runoff of nitrogen and phosphorus from agricultural fertilizers. This excess of nutrients stimulates the rapid growth of algae and aquatic plants. When these plants die and decompose, the process consumes vast amounts of dissolved oxygen, often leading to the suffocation of fish and other organisms.

29. (C) CH_3NCO
Methyl Isocyanate is a highly toxic and volatile organic compound with the chemical formula CH_3NCO. It gained global notoriety as the hazardous gas released during the Bhopal Gas Tragedy. This chemical is extremely reactive with water and human tissues, causing severe respiratory damage and systemic poisoning. Understanding its chemical properties was crucial for medical responders and remains industrial safety knowledge.

30. (D) Fluoride
Fluorosis is a specific pathological condition caused by the chronic ingestion of excessive fluoride, typically through contaminated groundwater. It manifests in two primary forms: dental fluorosis, which affects tooth enamel, and skeletal fluorosis, which causes debilitating bone and joint deformities. While other pollutants like arsenic and lead are toxic, they do not cause the symptoms specifically associated with fluorosis.

31. (B) IV, II, I, III
Efficient municipal solid waste management follows a logical operational flow to maximize resource recovery. The process begins with segregation at the source, where waste is separated into different categories. This is followed by collection and transportation to processing facilities for treatment, such as composting or recycling. The final step is the disposal of non-recyclable inert materials in a landfill.

32. (B) Polluter Pays Principle
The Polluter Pays Principle is a fundamental legal doctrine in environmental law. It dictates that the parties responsible for producing pollution must bear the financial costs of managing it and remediating any environmental damage. This principle serves to internalize environmental costs and encourages industries to adopt cleaner technologies and more sustainable production methods to avoid significant economic liabilities.

33. (B) Source segregation of waste into biodegradable and non-biodegradable categories.
The Swachh Bharat Mission (Urban) emphasizes sustainable solid waste management through the mandatory segregation of waste at the source. Households are encouraged to separate waste into biodegradable and non-biodegradable categories. This practice is essential for efficient composting of organic matter and the recovery of recyclable materials, thereby reducing the total volume of waste that eventually reaches municipal landfills.

34. (D) Maintenance of the National Air Quality Monitoring Programme (NAMP).
The Central Pollution Control Board is responsible for the National Air Quality Monitoring Programme, which tracks air pollutant levels across India. While established under the Water Act of 1974, it also performs functions under the Air Act. It serves as a technical body rather than a direct administrative arm of the Prime Minister's Office and provides the framework for regulation.

35. (A) Open dumping and burning of waste at the Devguradia site.
Indore is widely recognized for its scientific approach to waste management, which excludes

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ANSWERS

1. (C) Poor quality causing breathing discomfort on prolonged exposure.
An Air Quality Index value between 201 and 300 is categorized as poor. This level of atmospheric contamination typically leads to breathing discomfort for most people upon prolonged exposure. Individuals with existing heart or lung diseases are at higher risk. Consistent monitoring of these indices is crucial for public health advisory and urban environmental management strategies.

2. (B) Reduce, Reuse, Recycle, Disposal
The waste management hierarchy prioritizes strategies based on their environmental impact. Reducing waste generation at the source is the most preferred method, followed by reusing items to extend their lifecycle. Recycling transforms materials into new products, while disposal in landfills represents the final and least preferred option due to its long-term ecological footprint and significant loss of resources.

3. (B) 1974
The Madhya Pradesh Pollution Control Board was constituted in 1974 under the provisions of the Water Prevention and Control of Pollution Act. This statutory body is responsible for implementing environmental laws and monitoring pollution levels across the state. It plays a critical role in regulating industrial effluents and ensuring that water bodies remain protected from harmful contaminants.

4. (C) Use of plants to absorb and detoxify contaminants from soil and water.
Phytoremediation is a sustainable green technology that utilizes various plant species to remove, transfer, or stabilize environmental contaminants. These plants can absorb heavy metals and organic pollutants from contaminated soil or groundwater through their root systems. This biological approach is often more cost-effective and environmentally friendly compared to traditional mechanical or chemical remediation methods used in industrial sites.

5. (A) I, II, and III only
The Narmada River faces significant ecological challenges from untreated urban sewage and agricultural runoff containing excessive fertilizers. These factors lead to nutrient enrichment and localized eutrophication. Additionally, illegal sand mining activities disrupt the natural riverbed and aquatic habitats. While various funding sources support conservation efforts, stating that the action plan was exclusively funded by one entity is factually incorrect.

NODIA

6. (B) Indore - Highest levels of radioactive pollution in the state
While Indore faces challenges related to rapid urbanization and waste management, it is not associated with the highest levels of radioactive pollution in Madhya Pradesh. In contrast, Bhopal deals with legacy industrial waste, Pithampur manages heavy industrial effluents, and Singrauli faces significant air quality issues due to coal-fired power plants and extensive mining activities within the region.

7. (B) Introduction of harmful contaminants into the natural environment causing adverse change.
Environmental pollution refers to the introduction of harmful materials or energy into the natural environment, leading to adverse changes in ecosystems. These contaminants can be chemical substances, noise, heat, or light. Such changes often disrupt biological processes and pose significant risks to human health. Understanding these interactions is essential for developing effective environmental protection policies and sustainable developmental practices.

8. (B) Direct industrial pollution from Pithampur into the main Chambal channel.
The Chambal River is recognized as one of India's cleanest major river systems, hosting the National Chambal Sanctuary for gharial conservation. While threats like sand mining and illegal fishing exist, industrial effluents from the Pithampur belt primarily affect the Gambhir and Kshipra rivers rather than discharging directly into the

These bacteria themselves may not always cause disease, but their presence suggests that other pathogenic organisms such as viruses or parasites associated with sewage may be present. This makes coliform testing fundamental for drinking water safety.

45. (B) Refuse, Reuse, Recycle, Recover
The 4R concept provides a framework for sustainable waste management. Refusing unnecessary items is the most effective way to prevent waste. Reusing products extends their life, while recycling processes materials into new goods. Recovery involves extracting energy or materials from waste that cannot be reused or recycled. This sequence prioritizes waste prevention over treatment and disposal to minimize environmental impact.

46. (B) I, III, and IV
Microplastics are tiny fragments that persist in the environment and can carry chemical pollutants into the marine food chain. The combustion of certain plastics, like PVC, releases highly toxic dioxins. Contrary to being negligible, single-use plastics actually represent a very large and problematic fraction of modern municipal solid waste. Effectively managing these materials is a major challenge for environment.

47. (C) Statement I is incorrect but Statement II is correct.
Decades after the 1984 gas tragedy, the former Union Carbide plant site in Bhopal has not been fully remediated. Significant quantities of toxic chemical waste remain stored or buried at the facility. Consequently, long-term environmental contamination continues to degrade the soil and groundwater quality in surrounding communities, posing health risks to thousands of residents who live near the industrial site.

48. (B) Improper disposal of hazardous industrial waste and effluent discharge.
The Pithampur industrial belt is one of Madhya Pradesh's largest manufacturing hubs and faces significant environmental challenges. The primary issues involve the improper disposal of hazardous industrial solids and the discharge of chemical effluents into local drainage systems. These practices have led to the contamination of nearby water bodies and soil, necessitating stricter regulatory oversight and improved waste treatment infrastructure.

49. (A) Chemical precipitation of dissolved metals into solid particles.
To treat industrial effluents containing heavy metals, chemical precipitation is often the most effective initial step. This process involves adding chemicals that react with dissolved metals to form insoluble solid particles, which can then be physically removed through sedimentation or filtration. This is superior to simple dilution, which does not remove toxins, or biological treatments, which metals can inhibit.

50. (C) Leaching into groundwater causing nitrate contamination.
The excessive application of nitrogenous fertilizers in farming leads to several environmental problems. One major consequence is the leaching of excess nitrates through the soil into groundwater reservoirs. This contamination can make well water unsafe for human consumption, potentially causing conditions like methemoglobinemia. Furthermore, it contributes to the runoff that causes eutrophication in surface water bodies and increases emissions.

51. (C) 120 microns
The Indian government has progressively increased the mandated minimum thickness for plastic carry bags to improve their durability and facilitate collection for recycling. As of recent regulations, the limit was raised to 120 microns. By banning thinner bags, which are often discarded after a single use and are difficult to process, the policy aims to reduce the overall volume of litter.

52. (D) Extended Producer Responsibility (EPR)
Extended Producer Responsibility is an environmental policy approach that extends a manufacturer's responsibility for a product to the post-consumer stage of its life cycle. It requires producers to establish systems for taking back their products, such as electronics or packaging, for recycling or safe disposal. This shifts the management burden away from municipalities and encourages more sustainable product design.

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(A) Exporting municipal waste to specialized foreign recycling facilities.
(B) Replacing all manual sweeping activities with heavy machinery.
(C) Making cities "Garbage Free" and remediating legacy dumpsites.
(D) Banning the production of all plastic materials within India.

86. Biomagnification of pesticides like DDT in aquatic food chains typically results in which of the following?
(A) Lower pesticide concentrations in top predators than primary producers.
(B) Eggshell thinning and reproductive failure in fish-eating birds.
(C) Rapid genetic mutation of phytoplankton species in the water.
(D) Increased resistance of water hyacinth plants to heavy metals.

87. Acid mine drainage is a significant source of water pollution. It occurs when water interacts with which of the following minerals commonly found in coal mines?
(A) Bauxite
(B) Pyrite (Iron sulfide)
(C) Calcite
(D) Gypsum

88. Which of the following correctly pairs a zone with its permissible ambient noise standard during nighttime under Indian regulations?
(A) Commercial Zone - 45 dB(A)
(B) Industrial Zone - 70 dB(A)
(C) Residential Zone - 55 dB(A)
(D) Silence Zone - 50 dB(A)

89. In the context of phytoremediation, what is "phytoextraction"?
(A) Plants releasing enzymes to break down pollutants in the soil.
(B) Absorption of heavy metals from soil into above-ground shoots.
(C) The process of plants capturing carbon dioxide from the atmosphere.
(D) Prevention of wind erosion of contaminated topsoil by plants.

90. Eutrophication in rivers like the Narmada due to agricultural runoff eventually leads to a severe drop in which of the following parameters, causing the death of aquatic life?
(A) Dissolved Oxygen
(B) Salinity
(C) Temperature
(D) Turbidity

91. Which of the following is the best example of public participation in pollution control?
(A) A government agency drafting emission norms in absolute secrecy.
(B) Utilizing public hearing mechanisms under the EIA process.
(C) Industries self-reporting profit margins to the national stock exchange.
(D) The CPCB purchasing new technical air quality monitoring equipment.

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92. The 'Namami Devi Narmade' Seva Yatra was an awareness campaign in Madhya Pradesh primarily aimed at:
(A) Promoting navigation and cruise tourism on the Narmada River.
(B) Constructing a series of new mega-dams across the Narmada.
(C) River conservation, pollution control, and afforestation.
(D) Encouraging heavy industrialization within the Narmada valley.

93. Thermal pollution from power plants primarily impacts aquatic ecosystems by:
(A) Increasing the water's transparency.
(B) Lowering the pH of the water drastically.
(C) Increasing the concentration of heavy metals in fish tissues.
(D) Decreasing the solubility of oxygen in the water.

94. Identify the incorrectly matched pair regarding rivers in Madhya Pradesh and their specific pollution challenge.
(A) Kshipra River - Pollution from mass bathing and religious offerings during Melas.
(B) Khan River (Indore) - Severe domestic sewage and industrial effluent discharge.
(C) Betwa River - E-waste dumping directly from the Mandideep industrial area.
(D) Chambal River - Threats to riverine ecology from illegal sand mining.

chemicals if not processed through specialized industrial recycling facilities.

62. (A) AQI - Water quality measurement tool
The Air Quality Index is a standardized tool used specifically for reporting and communicating the quality of air to the public. It is not used for measuring water quality. Other pairings are correct: the CPCB is the national agency for pollution, NEERI is a premier environmental research institute, and the NGT is the specialized judicial body for environmental disputes.

63. (A) Both Statement I and Statement II are correct.
High levels of fluoride in drinking water cause progressive health issues. Initial exposure typically leads to dental fluorosis, which results in staining and pitting of the teeth. Long-term exposure to higher concentrations can lead to skeletal fluorosis, a far more severe condition where fluoride accumulates in the bones. This causes significant joint pain, stiffness, and permanent skeletal deformities, affecting mobility.

64. (C) Chlorofluorocarbons (CFCs)
While nitrogen dioxide, sulfur dioxide, and carbon monoxide are common urban air pollutants that directly impact health, Chlorofluorocarbons are unique. CFCs are relatively inert at the ground level but migrate to the stratosphere, where they break down and release chlorine atoms that destroy the ozone layer. This global environmental issue is distinct from the localized respiratory problems caused by smog.

65. (A) High decibel noise from commercial airports
Soil pollution involves the introduction of chemical or physical contaminants that degrade land quality. Sources include the excessive use of pesticides, the dumping of industrial solid waste, and petroleum spills. Noise pollution, however, is a form of energy pollution that travels through the air. While it can affect the behavior of soil-dwelling animals, it does not physically contaminate the soil structure.

66. (C) Hazardous
The Indian National Air Quality Index uses six distinct, color-coded categories to communicate air quality. These are Good, Satisfactory, Moderately Polluted, Poor, Very Poor, and Severe. Although other countries may use the term "Hazardous" in their respective indices, it is not one of the official categories used in the Indian system to describe atmospheric conditions and associated health risks.

67. (C) Smoke and Fog
The term smog was originally coined to describe the visible atmospheric mixture of smoke and fog. In modern urban environments, it often refers to a complex blend of various air pollutants, including particulate matter and ground-level ozone. This mixture reduces visibility and poses significant respiratory risks. Understanding the composition of smog is essential for developing effective urban air quality management strategies.

68. (B) Binding to hemoglobin to reduce oxygen-carrying capacity.
Carbon Monoxide is a colorless, odorless gas that is particularly dangerous because it has a higher affinity for hemoglobin than oxygen. When inhaled, it binds to hemoglobin to form carboxyhemoglobin, effectively reducing the blood's capacity to transport oxygen to vital organs and tissues. This can lead to headaches, dizziness, and, in high concentrations, fatal asphyxiation, making it a major pollutant.

69. (B) Statement I is correct but Statement II is incorrect.
High-level radioactive waste, such as spent nuclear fuel, is hazardous and generates substantial heat, necessitating complex cooling and deep geological disposal. It is incorrect to classify spent nuclear fuel as low-level waste; low-level waste typically consists of contaminated items like tools or clothing. Managing these different waste streams requires strictly regulated and distinct safety and storage protocols for protection.

70. (C) Nitrogen oxides and volatile organic compounds (VOCs).
Photochemical smog is a type of air pollution produced when ultraviolet light from the sun reacts with nitrogen oxides and volatile organic compounds in the atmosphere. This reaction creates a secondary mixture of pollutants, including peroxyacetyl nitrates and ground-level ozone. This phenomenon is common in sunny, warm urban areas with high vehicle traffic, resulting in a characteristic brownish haze.

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71. (A) Bioventing - Supplying air and nutrients into soil to stimulate indigenous bacteria.
Bioventing is an in-situ bioremediation technology that involves supplying oxygen and nutrients into the soil to stimulate the growth of indigenous aerobic bacteria. These microbes then break down organic contaminants like petroleum hydrocarbons. Bioaugmentation involves adding external microbes, and biostimulation focuses on enhancing existing microbial activity rather than using genetically modified plants, which is more characteristic of phytoremediation.

72. (B) Replacing personal car use with public transport or cycling.
While small changes like switching to LED bulbs are helpful, the most substantial way for an individual to reduce their carbon footprint is by changing transportation habits. Replacing personal car use with public transport, cycling, or walking significantly reduces the greenhouse gas emissions associated with fossil fuel combustion. This choice has a large-scale impact on personal energy consumption and overall contributions to climate.

73. (D) Decomposition of organic waste in landfills.
Nitrogen Oxides are primarily produced during high-temperature combustion processes where atmospheric nitrogen reacts with oxygen. Major sources include vehicle exhausts, power plants, and industrial boilers. Landfills are significant sources of methane and carbon dioxide due to the anaerobic decomposition of organic waste, but they are not primary emitters of nitrogen oxides, which are associated with burning fossil fuels.

74. (A) Both Statement I and Statement II are correct.
The National Green Tribunal was established to provide a specialized forum for environmental cases. To ensure the speedy disposal of matters, it is not strictly bound by the formal procedures of the Code of Civil Procedure. Instead, the tribunal is guided by the principles of natural justice, allowing it more flexibility to address complex environmental issues effectively while ensuring fairness.

75. (D) Prevention, control, and abatement of air pollution.
The primary objective of the Air Prevention and Control of Pollution Act of 1981 is to provide for the prevention, control, and abatement of air pollution in India. The Act establishes the legal framework for monitoring air quality, setting emission standards for industries and vehicles, and empowering pollution control boards to enforce these regulations to protect public health and nature.

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76. (D) Loss of nesting sandbanks due to illegal sand mining.
The critically endangered Gharial depends on specific sandbanks along the Chambal River for nesting and basking. Illegal sand mining activities directly destroy these essential habitats, leading to reproductive failure and population decline. While other factors like illegal fishing and water diversion also pose risks, the physical destruction of nesting sites through mining is one of the most immediate threats.

77. (D) Skin lesions and Blackfoot disease
Long-term exposure to arsenic through contaminated drinking water is a major public health crisis. It is most closely associated with characteristic skin lesions, such as hyperpigmentation and keratosis. Furthermore, chronic arsenicosis can lead to Blackfoot disease, a severe peripheral vascular condition. Other diseases like Minamata or Itai-Itai are caused by different heavy metals, specifically mercury and cadmium, respectively.

78. (D) Recognition of informal kabadiwalas as primary recyclers.
The E-Waste Management Rules in India emphasize formalizing the recycling process to prevent environmental contamination. While they recognize the role of various stakeholders and implement Extended Producer Responsibility, they do not designate informal kabadiwalas as primary recyclers. Instead, the rules aim to integrate these workers into a regulated system to ensure that hazardous components are handled safely by authorized facilities.

79. (B) Mandatory management of end-of-life disposal for plastics and e-waste.
In India, Extended Producer Responsibility is a mandatory regulatory framework that applies specifically to the management of plastic waste and electronic waste. It requires producers, importers, and brand owners to ensure the environmentally sound management of their products at the end of their life. This includes meeting collection and recycling targets, shifting responsibility from government back to the manufacturers.

80. (D) Warren Anderson
Warren Anderson was the Chairman and CEO of Union Carbide Corporation during the 1984 Bhopal Gas Tragedy. Following the disaster, he faced significant legal scrutiny and was declared a fugitive by Indian courts for failing to appear for trial. His role remains a central and controversial part of the disaster's history regarding corporate accountability and the legal aftermath in Bhopal.

81. (C) Indore relies entirely on unscientific open dumping without any mechanical processing of waste.
The statement that Indore relies on unscientific open dumping is entirely incorrect. Indore is celebrated globally for its advanced and scientific waste management system, which includes 100% waste processing and zero landfilling of organic waste. The city successfully cleared its legacy dumpsites through bioremediation and uses innovative technologies like biomethanation to manage its municipal solid waste effectively and sustainably.

82. (A) Bhopal
The headquarters of the Madhya Pradesh Pollution Control Board is located in Bhopal, the state capital. As the primary regulatory body for environmental protection in the state, it operates from this central location to oversee various regional offices. The board is responsible for monitoring air and water quality, enforcing environmental laws, and granting industrial consents to ensure sustainable development.

83. (D) The Principle of Absolute Liability
Following the Bhopal Gas Tragedy, the Supreme Court of India established the Principle of Absolute Liability. This doctrine holds that an industry engaged in inherently dangerous or hazardous activities is absolutely liable for any harm caused by its operations. Unlike strict liability, it allows for no exceptions, ensuring that companies cannot escape the financial consequences of industrial accidents or hazardous leaks.

84. (C) Augment financial resources of Pollution Control Boards.
The Water Prevention and Control of Pollution Cess Act was enacted in 1977 to provide a sustainable funding mechanism for Pollution Control Boards. It imposes a cess on water consumed by certain industries and local authorities. The revenue generated is used to augment the financial resources of the boards, enabling them to perform their statutory duties of monitoring and controlling pollution.

85. (C) Making cities "Garbage Free" and remediating legacy dumpsites.
Swachh Bharat Mission-Urban 2.0 aims to achieve the vision of "Garbage Free Cities" across India. A major pillar of this mission is the complete remediation of legacy waste dumpsites that have accumulated in cities over decades. By processing this old waste and reclaiming land, the mission seeks to transition towards circular economy principles and ensure all new waste is processed.

86. (B) Eggshell thinning and reproductive failure in fish-eating birds.
DDT is a persistent organic pollutant that undergoes biomagnification, increasing in concentration at higher levels of the food chain. In aquatic environments, top predators like fish-eating birds accumulate high levels of DDT. This chemical interference with calcium metabolism leads to the production of thin-shelled eggs that break easily during incubation, resulting in reproductive failure and significant avian population declines.

87. (B) Pyrite (Iron sulfide)
Acid mine drainage is a major environmental problem in mining regions. It occurs when pyrite, a common iron sulfide mineral found in coal, is exposed to air and water during mining. This interaction creates sulfuric acid and dissolved iron, which flow into nearby streams. The

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17. Which of the following is an incorrect statement regarding cold waves?
(A) MP is unaffected by cold waves due to its latitude
(B) Cold waves occur in northern and central Indian states
(C) A cold wave is a drop in minimum temperature by 4.5°C
(D) Cold waves cause frost damage to gram and mustard crops

18. Which of the following is an immediate secondary effect frequently caused by high-magnitude earthquakes in mountainous terrains?
(A) Landslides
(B) Cyclones
(C) Droughts
(D) Heat waves

19. Consider the following statements regarding the Pradhan Mantri Fasal Bima Yojana (PMFBY) as a drought relief mechanism:
I. It provides comprehensive insurance cover against failure of the crop.
II. The premium rate paid by farmers for all Kharif crops is fixed at 5%.
III. It covers yield losses due to non-preventable risks like drought and dry spells.
IV. Technology like remote sensing and drones are encouraged for crop cutting experiments.
Which of the following combinations is correct?
(A) I, II and III only
(B) I, III and IV only
(C) II, III and IV only
(D) I, II, III and IV

20. Match the Drought Type in List I with its corresponding Indicator in List II:
List I: Drought Type
P. Meteorological
Q. Hydrological
R. Agricultural
S. Socio-economic
List II: Indicator
1. Significant rainfall deficiency over a period
2. Depletion of surface and sub-surface water resources
3. Soil moisture deficit leading to crop failure
4. Reduced income and regional food shortage
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-1, R-2, S-3

21. Given below are two statements, one labeled as Assertion (A) and the other as Reason (R):
Assertion (A): Deaths due to lightning strikes are steadily increasing in the rural areas of Madhya Pradesh.
Reason (R): Rural populations, especially farmers and laborers, frequently work outdoors in open fields during pre-monsoon and monsoon thunderstorms.
Select the correct answer from the codes given below:
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

22. In the seismic zoning map of India, the majority of the landmass of Madhya Pradesh falls under which seismic zones?
(A) Zone IV and V
(B) Zone II and III
(C) Zone I and II
(D) Zone III and IV

23. Which of the following is an incorrect statement concerning the impact of Narmada floods on human settlements?
(A) Flash floods often submerge low-lying residential areas
(B) Dam water release is necessary to manage heavy catchment rain
(C) Seasonal floods cause substantial losses to major Kharif crops
(D) Dam backwaters do not create risks for upstream settlements

24. In the plains, a heat wave is generally declared when the maximum temperature of a station reaches at least what value?
(A) 30 degrees Celsius
(B) 35 degrees Celsius
(C) 40 degrees Celsius
(D) 45 degrees Celsius

NODIA

96. (B) Statement I is correct but Statement II is incorrect.
Indore's transformation into India's cleanest city is built on a foundation of 100% door-to-door waste collection and strict source segregation. However, the claim that public participation and spot fines played no role is false. In reality, strong community engagement, public awareness campaigns, and the enforcement of penalties for littering were critical components that changed public behavior for long-term success.

97. (A) Agricultural runoff carrying fertilizers over a large watershed.
Non-point source pollution comes from diffuse sources rather than a single, identifiable pipe or location. Agricultural runoff is a classic example, as it carries fertilizers and pesticides from numerous fields across a large area into water bodies. In contrast, discharge pipes from factories or sewage drains are point sources because the origin of the pollution can be precisely located.

98. (B) Biomagnification of toxic chemicals in higher predators.
Microplastics in the ocean are often mistaken for food by small marine organisms. These particles can absorb and concentrate persistent organic pollutants from the surrounding water. As larger predators eat these smaller organisms, the toxins and plastics accumulate and reach higher concentrations. This process of biomagnification poses a significant risk to the health of top predators, including humans.

99. (D) Penetration into alveolar regions and the bloodstream.
PM 2.5 particles are particularly hazardous to human health due to their extremely small size. Unlike larger dust particles, they can bypass the natural filters in the nose and throat, traveling deep into the alveolar regions of the lungs. From there, they can cross into the bloodstream, causing systemic inflammation and increasing the risk of respiratory diseases and heart attacks.

100. (C) SDG 12: Responsible Consumption and Production.
Sustainable Development Goal 12 focuses on ensuring sustainable consumption and production patterns. A key target of this goal is the environmentally sound management of chemicals and all wastes throughout their life cycle. By reducing waste generation through prevention, reduction, recycling, and reuse, this goal aims to significantly reduce the negative impacts of human activities on health and the environment.

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resulting highly acidic water is toxic to aquatic life and can leach other heavy metals.

88. (B) Industrial Zone - 70 dB(A)
Indian noise pollution regulations specify different permissible limits for daytime and nighttime across four zones. In an industrial zone, the nighttime limit is set at 70 decibels, reflecting the continuous nature of many industrial processes. For comparison, residential zones have stricter limits of 45 decibels at night to protect public health and ensure quiet periods for rest and sleep.

89. (B) Absorption of heavy metals from soil into above-ground shoots.
Phytoextraction is a specific type of phytoremediation where specialized plants, known as hyperaccumulators, absorb heavy metals or other contaminants from the soil through their roots. These toxins are then translocated and concentrated into the plant's above-ground parts, such as leaves and stems. Once the plants have grown, they are harvested and safely disposed of, effectively removing the contaminants permanently.

90. (A) Dissolved Oxygen
Eutrophication leads to a massive increase in organic matter as algae and plants die and decay. Microorganisms that decompose this material use up nearly all the available dissolved oxygen in the water. This rapid depletion creates "dead zones" where oxygen levels are too low to support fish and other aquatic life. Consequently, the collapse of oxygen is the primary cause of mortality.

91. (B) Utilizing public hearing mechanisms under the EIA process.
Public participation is a key component of effective environmental management. The Environmental Impact Assessment process in India includes a mandatory public hearing mechanism. This allows local communities and stakeholders to voice concerns and provide feedback on proposed industrial projects. This transparent process ensures that environmental decision-making considers the social and ecological impacts on the people who will be most affected.

92. (C) River conservation, pollution control, and afforestation.
The 'Namami Devi Narmade' Seva Yatra was a major state-wide awareness campaign launched by the Madhya Pradesh government. Its primary goal was the holistic conservation of the Narmada River. The initiative focused on controlling pollution, promoting organic farming along the riverbanks to reduce chemical runoff, and conducting massive afforestation drives. By engaging the public, it aimed to ensure long-term sustainability.

93. (D) Decreasing the solubility of oxygen in the water.
Thermal pollution significantly affects aquatic ecosystems because the solubility of oxygen in water is temperature-dependent. As the water temperature increases due to industrial heat discharge, it can hold less dissolved oxygen. This creates a stressful environment for aquatic organisms that require oxygen for survival. Furthermore, increased temperatures can speed up metabolic rates, further increasing their demand for oxygen.

94. (C) Betwa River - E-waste dumping directly from the Mandideep industrial area.
While the Betwa River does face pollution challenges, describing its primary issue as direct e-waste dumping from Mandideep is incorrect. Most industrial areas primarily contribute chemical effluents and general industrial waste. E-waste is typically managed through separate collection and recycling streams. Other pairings, such as the Khan River's sewage issues and the Kshipra's challenges, are well-documented environmental concerns.

95. (A) Solar cookers
Traditional cooking methods in rural India often rely on the burning of solid biomass fuels like firewood, cow dung cakes, and crop residues. These fuels release significant amounts of smoke and particulate matter, leading to high levels of indoor air pollution. In contrast, solar cookers utilize clean energy from the sun and do not involve any combustion, making them clean.

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9. What is the primary cause of crop damage from hailstorms in the agricultural districts of Madhya Pradesh?
(A) Extreme frost freezing the root systems
(B) Falling ice stones destroying plant structures
(C) Prolonged waterlogging in agricultural fields
(D) Increased soil salinity following the storm

10. In the context of Madhya Pradesh, which geographical regions are marginally vulnerable to localized landslides during intense monsoons?
(A) The Malwa Plateau
(B) The Chambal Ravines
(C) The Vindhyan-Satpura ranges
(D) The Bundelkhand plains

11. Match the Disaster in List I with its corresponding Nodal Ministry at the Central Level in List II:
List I: Disaster
P. Earthquakes
Q. Floods
R. Cyclones
S. Epidemics
List II: Nodal Ministry
1. Ministry of Home Affairs
2. Ministry of Jal Shakti
3. Ministry of Earth Sciences
4. Ministry of Health and Family Welfare
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-1, R-2, S-3

12. Match the Earthquake Term in List I with its corresponding Description in List II:
List I: Earthquake Term
P. Focus
Q. Epicenter
R. Seismograph
S. Richter Scale
List II: Description
1. Point of origin inside the earth
2. Point on the surface directly above the origin
3. Instrument used to record seismic waves
4. Measures the magnitude of earthquake energy
(A) P-2, Q-1, R-4, S-3
(B) P-3, Q-4, R-1, S-2
(C) P-1, Q-2, R-3, S-4
(D) P-4, Q-3, R-2, S-1

13. Identify the incorrectly matched pair regarding regions of MP and their prevalent disaster vulnerability.
(A) Sheopur - Tsunami
(B) Narmadapuram - Floods
(C) Datia - Droughts
(D) Jabalpur - Earthquakes

14. How is a meteorological drought officially defined?
(A) Surface reservoir levels fall below twenty percent of their total capacity
(B) Soil moisture levels are insufficient to sustain commercial crop growth
(C) Seasonal rainfall is less than seventy-five percent of the long-term average
(D) Public water supply systems face widespread failure due to demand surges

15. Consider the following statements regarding lightning as a disaster in Madhya Pradesh:
Statement I: Lightning strikes have emerged as a leading cause of weather-related deaths in Madhya Pradesh.
Statement II: Lightning occurs due to massive electrostatic discharge between electrically charged regions within clouds or between a cloud and the earth's surface.
Which of the following is correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

16. Which of the following represents the standard legal definition of a disaster?
(A) A catastrophic event from natural or human causes that exceeds local community coping capacity
(B) A localized meteorological phenomenon occurring primarily in coastal or flood-prone regions
(C) A sudden environmental disruption causing significant structural damage to vital public infrastructure
(D) A minor atmospheric disturbance leading to heavy rainfall and temporary drainage congestion

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CHAPTER 12

Natural Calamities and Disaster Management

1. Consider the following statements regarding seismic zones:
I. India is officially divided into four seismic zones: II, III, IV, and V.
II. Seismic Zone V represents the highest level of seismicity.
III. Madhya Pradesh contains several districts that fall into Seismic Zone V.
Which of the above statements are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

2. Which of the following perils is generally NOT covered under the Pradhan Mantri Fasal Bima Yojana (PMFBY)?
(A) Prevented sowing due to rainfall deficit
(B) Post-harvest losses from cyclonic rains
(C) Damage from nuclear risks or acts of war
(D) Crop loss from localized hailstorm events

3. Find the odd one out among the following classifications of natural disasters.
(A) Major tectonic earthquakes
(B) Severe tropical cyclones
(C) Industrial chemical spills
(D) Widespread seasonal floods

4. Which of the following represents the correct sequence of phases in the Disaster Management Cycle?
(A) Response, Mitigation, Recovery, Preparedness
(B) Recovery, Preparedness, Mitigation, Response
(C) Mitigation, Preparedness, Response, Recovery
(D) Preparedness, Recovery, Response, Mitigation

5. Given below are two statements, one labeled as Assertion (A) and the other as Reason (R):
Assertion (A): Deforestation in the catchment areas of major rivers increases the frequency and severity of floods.
Reason (R): The removal of forest cover reduces soil infiltration capacity and increases rapid surface runoff.
Select the correct answer from the codes given below:
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

6. Find the odd one out among the following climate-related disasters affecting Madhya Pradesh.
(A) Heat wave
(B) Seismic tremor
(C) Hailstorm
(D) Drought

7. Which of the following defines the relationship between hazard, vulnerability, and disaster risk?
(A) Risk = Hazard / Vulnerability
(B) Risk = Hazard × Vulnerability
(C) Risk = Hazard + Vulnerability
(D) Risk = Hazard – Vulnerability

8. The Bundelkhand region of Madhya Pradesh is recognized as a recurring crisis zone primarily due to which natural disaster?
(A) Avalanches
(B) Severe Droughts
(C) Cyclones
(D) Cloudbursts

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25. Consider the following statements regarding drought-prone districts in Madhya Pradesh:
Statement I: Districts in the Bundelkhand region, such as Tikamgarh and Chhatarpur, are highly prone to recurrent droughts.
Statement II: The hard rock terrain in Bundelkhand facilitates excellent groundwater recharge, mitigating agricultural losses.
Which of the following is correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

26. Which scale is used to measure the total energy released at the source of an earthquake?
(A) Mercalli Scale
(B) Beaufort Scale
(C) Fujita Scale
(D) Richter Scale

27. Although direct cyclone landfalls do not occur in Madhya Pradesh, what is the major relevance of cyclones to the state?
(A) Heavy secondary rainfall leading to inland flooding
(B) Direct storm surge impact on major inland rivers
(C) Extreme drops in average winter season temperatures
(D) Generation of localized tsunamis in large reservoirs

28. Which of the following statements is correct regarding flood-prone areas in Madhya Pradesh?
(A) They occur mainly in the Narmada, Tapti, and Chambal basins during heavy monsoons
(B) They are triggered by the sudden outburst of high-altitude glacial lake formations
(C) They are caused by frequent storm surges impacting the central Narmada valley area
(D) They are non-existent due to the plateau geography of the central Indian landscape

29. Hailstorms in Madhya Pradesh typically cause the most severe economic impact during which agricultural phase?
(A) Initial sowing of the Kharif crop season
(B) Final harvesting of major Kharif crops
(C) Maturing and harvesting of Rabi crops
(D) Initial sowing of regional Zaid crops

30. Which form of drought is considered the most appropriate initial trigger that eventually leads to all other types of droughts?
(A) Hydrological drought
(B) Agricultural drought
(C) Socio-economic drought
(D) Meteorological drought

31. Which of the following forces is NOT typically integrated or deputed into the State Disaster Response Force (SDRF) of Madhya Pradesh?
(A) Madhya Pradesh Police personnel
(B) Local Home Guard volunteers
(C) Private security agency staff
(D) Special Armed Force personnel

32. How do United Nations agencies like UNDP primarily assist state governments in disaster management?
(A) By deploying military troops for physical rescue operations
(B) By providing technical assistance and supporting policies
(C) By taking over the administration of disaster-affected districts
(D) By acting as the primary funding source for insurance schemes

33. Consider the following statements regarding the National Disaster Management Authority (NDMA):
I. The Prime Minister of India is the ex-officio Chairperson of the NDMA.
II. It was established under the Disaster Management Act of 2005.
III. It consists of a maximum of nine members nominated by the Chairperson.
IV. The NDMA executes rescue operations directly using its own permanent armed troops.
V. It is responsible for laying down policies on disaster management.
Which combination of the above statements is correct?
(A) I, II, III and V only
(B) I, II, IV and V only
(C) II, III, IV and V only
(D) I, III, IV and V only

34. Match the Satellite or System in List I with its corresponding Primary Application in List II:

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List I: Satellite or System
P. INSAT
Q. IRS
R. NavIC
S. Bhuvan
List II: Primary Application
1. Meteorological observations and warnings
2. Resource monitoring and damage assessment mapping
3. Regional satellite navigation and positioning
4. Geoportal platform for spatial data visualization
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-1, R-2, S-3

35. What is the primary intended effect of implementing an Incident Response System (IRS) during a disaster?
(A) To ensure a coordinated management by integrating agencies
(B) To privatize the state's disaster response operations
(C) To delay resource deployment until a central audit is done
(D) To transfer all responsibilities to local non-profits

36. Which of the following correctly describes the role of NGOs and civil society in disaster response?
(A) They provide support for relief, rescue, and mobilization
(B) They have the legal authority to declare a state disaster
(C) They are prohibited from participating in response activities
(D) They replace local administration in managing law and order

37. Which of the following is the correct defining criterion for a cloud burst?
(A) Rainfall of 100 mm or more per hour in a local area
(B) Continuous precipitation lasting more than 48 hours
(C) Rainfall with hailstones larger than five centimeters
(D) Any rainfall event that triggers a sudden flash flood

38. Under the Sendai Framework, reducing which of the following is explicitly listed as one of its global targets?
(A) The number of active tectonic faults
(B) The number of tropical cyclones formed annually
(C) The total volume of seasonal monsoon rainfall
(D) Global disaster mortality by 2030

39. Find the odd one out among the tools and technologies used for disaster management and early warning.
(A) Remote Sensing Satellites
(B) Geographic Information Systems (GIS)
(C) Doppler Weather Radars
(D) Electron Microscopes

40. Match the Disaster Management Act 2005 Chapter in List I with its corresponding Authority or Provision in List II:
List I: Disaster Management Act 2005 Chapter
P. Chapter II
Q. Chapter III
R. Chapter IV
S. Chapter VII
List II: Authority or Provision
1. National Disaster Management Authority
2. State Disaster Management Authority
3. District Disaster Management Authority
4. National Disaster Response Force
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-1, R-2, S-3

41. What is a direct long-term environmental effect of frequent forest fires in national parks?
(A) Immediate increase in local groundwater tables
(B) Loss of biodiversity and degradation of soil quality
(C) Permanent cessation of all regional monsoon rains
(D) Sudden emergence of new volcanic hot spring systems

42. Arrange the following functional levels of the Incident Response System (IRS) in standard hierarchical order from top command to operational execution:

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1. Incident Commander
2. Operations Section
3. Planning Section
4. Logistics Section

Choose the correct option:
(A) 1, 2, 3, 4
(B) 1, 3, 2, 4
(C) 2, 1, 4, 3
(D) 4, 3, 2, 1

43. Consider the following statements regarding the Priorities for Action under the Sendai Framework:
I. Priority 1 focuses on understanding disaster risk.
II. Priority 2 focuses on strengthening disaster risk governance to manage disaster risk.
III. Priority 3 focuses on investing in disaster reduction for resilience.
IV. Priority 4 focuses on enhancing disaster preparedness for effective response.
Which of the following combinations is incorrect?
(A) I only
(B) II and III only
(C) IV only
(D) None of the above

44. What does the acronym CBDRR stand for in the context of disaster management?
(A) Central Bureau of Disaster Response and Recovery
(B) Capacity Building for Disaster Readiness and Relief
(C) Center for Biological Disaster Risk Remediation
(D) Community Based Disaster Risk Reduction

45. What is the primary objective of the School Safety Programme implemented in Madhya Pradesh?
(A) To provide free mid-day meals to all enrolled students
(B) To ensure structural safety and promote disaster education
(C) To train students exclusively for future military services
(D) To regulate the fee structure of regional private schools

46. In the hilly regions of Madhya Pradesh, flash floods are primarily characterized by which of the following?
(A) A slow, gradual rise of water levels over several weeks
(B) Destructive high-velocity water rising within a few hours
(C) Seawater inundation caused by the occurrence of high tides
(D) Groundwater seeping onto the surface over several months

47. Which of the following is an incorrect statement regarding compensation and relief norms for disaster victims?
(A) Relief provided is meant to be an immediate ex-gratia assistance, not a full replacement of lost property.
(B) Compensation norms are exclusively decided by the local Gram Panchayat without state guidelines.
(C) The State Disaster Response Fund (SDRF) is the primary fund available with state governments for disaster response.
(D) Ex-gratia payments are transferred directly to the bank accounts of the beneficiaries.

48. The Disaster Management Act, which provides the institutional and legal framework for disaster management in India, was enacted in which year?
(A) 1999
(B) 2001
(C) 2005
(D) 2009

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49. Identify the correct pair among the following UN agencies and their primary disaster-related mandate.
(A) WMO - Meteorological and climate-related warnings
(B) WHO - Global seismic activity and earthquake monitoring
(C) FAO - Urban search and rescue in dense metropolitan areas
(D) UNICEF - Industrial chemical spill management protocols

50. The Sendai Framework for Disaster Risk Reduction covers which specific time period?
(A) 2000 to 2015

(B) 2005 to 2015
(C) 2015 to 2030
(D) 2020 to 2040

51. Arrange the following stages of official cyclone warnings in their correct chronological order of issuance:
1. Cyclone Alert
2. Pre-Cyclone Watch
3. Post Landfall Outlook
4. Cyclone Warning

Choose the correct option:
(A) 2, 1, 4, 3
(B) 1, 2, 3, 4
(C) 2, 4, 1, 3
(D) 4, 1, 2, 3

52. Who acts as the ex-officio Chairperson of the State Disaster Management Authority (SDMA) in Madhya Pradesh?
(A) The Governor of Madhya Pradesh
(B) The Home Minister of Madhya Pradesh
(C) The Chief Secretary of Madhya Pradesh
(D) The Chief Minister of Madhya Pradesh

53. What is the most appropriate role of the District Collector in the context of local disaster management?
(A) To head the National Executive Committee
(B) To command the National Disaster Response Force
(C) To act as the Chairperson of the local DDMA
(D) To serve as the nodal officer for relief coordination

54. Which geoportal developed by ISRO is extensively used for mapping, monitoring, and providing remote sensing data for disaster management in India?
(A) Vahan
(B) Bhoomi
(C) Bhuvan
(D) Pragyan

55. Which of the following represents the correct chronological sequence of global disaster risk reduction frameworks?
(A) Yokohama Strategy, Hyogo Framework, Sendai Framework
(B) Hyogo Framework, Yokohama Strategy, Sendai Framework
(C) Sendai Framework, Yokohama Strategy, Hyogo Framework
(D) Yokohama Strategy, Sendai Framework, Hyogo Framework

56. The National Disaster Response Force (NDRF) is constituted under which central ministry?
(A) Ministry of Home Affairs
(B) Ministry of Defence
(C) Ministry of Earth Sciences
(D) Ministry of Environment, Forest and Climate Change

57. Consider the following statements regarding post-disaster rehabilitation and resettlement policy:
I. It includes reconstructing damaged houses using disaster-resilient technologies.
II. It focuses purely on physical rebuilding, ignoring psychological support.
III. It aims to restore livelihoods and local economies.
IV. It utilizes the principle of "Build Back Better".
V. Community participation is discouraged during the resettlement phase.

Which of the following combinations is incorrect?
(A) I and III only
(B) II and V only
(C) IV and V only
(D) I, III and IV only

58. Which of the following statements is correct regarding the Madhya Pradesh State Disaster Management Plan?
(A) It provides a framework for vulnerability analysis and recovery
(B) It relies entirely on international funding for implementation
(C) It exclusively covers response mechanisms for earthquakes
(D) It replaces District Disaster Management Plans completely

59. Consider the following statements regarding climate change and disasters:
Statement I: Climate change is increasing the frequency and intensity of extreme weather events like heat waves and intense rainfall.
Statement II: Madhya Pradesh is entirely

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insulated from climate change impacts due to its dense forest cover.
Which of the following is correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

60. Consider the following statements regarding early warning systems for floods and droughts:
I. Early warning systems only provide alerts after the disaster has occurred.
II. Effective early warning systems involve risk knowledge, monitoring, dissemination, and response capabilities.
III. The Central Water Commission (CWC) is responsible for issuing flood forecasts in India.
Which of the following combinations is correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

61. Find the odd one out regarding the commonly recognized types of droughts.
(A) Agricultural Drought
(B) Meteorological Drought
(C) Tectonic Drought
(D) Hydrological Drought

62. Consider the following statements regarding the State Disaster Response Force (SDRF) in Madhya Pradesh:
Statement I: The SDRF in Madhya Pradesh heavily draws its personnel from the Home Guards and State Police.
Statement II: The SDRF is strictly prohibited from conducting mock drills in schools.
Which of the following is correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

63. Consider the following statements regarding flood management in the Narmada basin:
Statement I: Large multi-purpose dams like the Indira Sagar and Sardar Sarovar play a critical role in moderating flood peaks.
Statement II: Unplanned release of excessive water from these dams can sometimes exacerbate downstream flooding.
Which of the following is correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

64. Which of the following is NOT typically considered a phase of post-disaster rehabilitation?
(A) Medical and psychological rehabilitation
(B) Economic rehabilitation and livelihood restoration
(C) Issuing early warnings for incoming cyclones
(D) Social rehabilitation for orphaned children

65. What is a primary cause for the increasing incidence of urban flash floods in major cities of Madhya Pradesh like Indore and Bhopal?
(A) Poor planning and choking of natural drainage systems
(B) Sudden melting of nearby high-altitude mountain glaciers
(C) Unexpected rise in the regional deep groundwater table
(D) Tectonic uplift of major urban residential centers

66. Find the odd one out among the following types of disasters based on their origin.
(A) Infectious disease pandemic
(B) Tectonic earthquake
(C) Geologic landslide
(D) Oceanic tsunami

67. Which mobile application has been launched to provide early warning alerts specifically for lightning strikes in India?
(A) Meghdoot
(B) Damini
(C) Mausam
(D) Sachet

68. What is the most appropriate proactive measure undertaken by the Forest Department to manage and prevent forest fires in national parks?
(A) Spraying the entire forest with liquid nitrogen tanks
(B) Creating and clearing physical fire lines

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18. (A) Landslides
High-magnitude earthquakes produce powerful ground vibrations that can destabilize steep mountain slopes. In rugged terrains, this shaking often acts as a trigger for secondary disasters such as landslides. The displacement of massive amounts of rock and soil can block roads, bury settlements, and dam rivers, frequently causing more immediate damage and loss of life than the initial seismic shock itself.

19. (B) I, III and IV only
The Pradhan Mantri Fasal Bima Yojana provides comprehensive insurance against non-preventable risks like droughts. It utilizes modern technologies such as remote sensing and drones to increase the accuracy of crop loss assessments. While the premium for Rabi crops is set at one point five percent, the fixed premium for Kharif food crops is two percent, not five percent.

20. (A) P-1, Q-2, R-3, S-4
Drought progresses through various stages identified by different indicators. It starts with meteorological drought when rainfall is deficient. This leads to hydrological drought as water bodies deplete, and agricultural drought when soil moisture fails to support crops. Finally, socio-economic drought occurs when these shortages impact the regional economy, leading to food scarcity and reduced income for the local population.

21. (A) Both A and R are true and R is the correct explanation of A.
Lightning strikes have become a major cause of mortality in rural Madhya Pradesh because of the vulnerability of people working in agriculture. Farmers and laborers often remain in open fields during monsoon thunderstorms to complete essential sowing or harvesting tasks. These open environments provide little protection, making outdoor workers primary targets for the electrostatic discharge occurring during such weather events.

22. (B) Zone II and III
The seismic zoning map of India categorizes the country based on the probability of earthquake occurrence. A significant portion of Madhya Pradesh is situated on the stable Deccan Plateau, falling into the low-risk Seismic Zone II. However, certain areas, particularly those along the Narmada-Son lineament and near Jabalpur, are classified under the moderate-risk Seismic Zone III due to historical activity.

23. (D) Dam backwaters do not create risks for upstream settlements
Flooding in the Narmada basin is a complex phenomenon influenced by both natural rainfall and artificial water management. While dams are designed to control flow and reduce downstream peaks, they also create large reservoirs. During heavy monsoons, the rising level of these backwaters can inundate upstream areas, displacing communities and affecting agricultural lands that were not previously prone to seasonal river flooding.

24. (C) 40 degrees Celsius
A heat wave is a period of abnormally high temperatures that exceeds certain predefined thresholds for a specific region. For the plains of India, the standard criterion for declaring a heat wave is reached when the maximum temperature of a station hits at least forty degrees Celsius. Persistent exposure to these temperatures poses serious health risks, including dehydration and heat exhaustion.

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25. (C) Statement I is true but Statement II is false.
The Bundelkhand region is notoriously prone to droughts because of its limited rainfall and challenging geography. The area is dominated by hard granite and gneissic rocks, which have very low porosity. This geological structure hinders the natural recharge of groundwater, causing water tables to drop rapidly after the monsoon. Consequently, the terrain exacerbates agricultural losses rather than mitigating them.

26. (D) Richter Scale
Seismologists use different tools to describe the strength of an earthquake. The Richter scale is a mathematical formula used to calculate the magnitude of an event based on the amplitude of seismic waves recorded by instruments. It specifically measures the total amount of energy released at the earthquake's point of origin, providing a quantitative value for scientific and administrative comparison.

and frequent hydrological droughts in the Bundelkhand region?
(A) Highly porous and permeable alluvial soil deposits
(B) Deep sedimentary basins with high storage potential
(C) Extensive network of perennial glacier-fed river systems
(D) Hard rock terrain with poor recharge capacity

79. Under the Disaster Management Act 2005, who heads the National Executive Committee (NEC) that assists the NDMA?
(A) Prime Minister
(B) Union Home Secretary
(C) Union Home Minister
(D) Cabinet Secretary

80. Lightning deaths in Madhya Pradesh occur predominantly during which weather phenomenon?
(A) Western disturbances occurring during peak winter
(B) Strong winds associated with the autumn equinox
(C) Summer heat waves occurring without cloud cover
(D) Pre-monsoon and active monsoon thunderstorms

81. The Richter scale used for measuring earthquakes is a logarithmic scale. What does an increase of 1.0 on this scale represent in terms of earthquake magnitude amplitude?
(A) A 2-fold increase in amplitude
(B) A 10-fold increase in amplitude
(C) A 32-fold increase in amplitude
(D) A 100-fold increase in amplitude

82. Identify the incorrect pair regarding disaster terminology.
(A) Mitigation - The post-disaster distribution of food packets
(B) Hazard - A potentially damaging physical event
(C) Vulnerability - The conditions determining the susceptibility of a community
(D) Risk - The expected losses due to a particular hazard

83. Which of the following is an incorrect statement regarding hailstorms in Madhya Pradesh?
(A) Hailstorms are most destructive to crops when they occur during the harvest season.
(B) Severe hailstorms can cause widespread structural damage to kutcha houses.
(C) Compensation for crop loss due to hailstorms is disbursed after detailed crop cutting and revenue surveys.
(D) Hailstorms in Madhya Pradesh are exclusively caused by cyclonic disturbances originating in the Arabian Sea.

84. How is Geographic Information System (GIS) technology most appropriately applied in flood management in the Chambal basin?
(A) By physically blocking the movement of flood waters
(B) By increasing the depth of the river channel mechanically
(C) By mapping inundation and identifying vulnerable zones
(D) By modifying the chemical composition of the floodwater

85. Cloudbursts are extreme precipitation events. When they occasionally occur in hilly terrains of Madhya Pradesh, they are localized events resulting in:
(A) Widespread regional and agricultural drought
(B) Dropping of ambient temperatures to freezing points
(C) Sudden flash floods and localized landslide events
(D) Permanent formation of new perennial river channels

86. Which of the following is NOT an example of a structural mitigation measure against floods?
(A) Construction of embankments
(B) Public awareness campaigns
(C) Building retention walls
(D) Constructing multi-purpose dams

87. Consider the following statements regarding the role of civil society in disaster management:
Statement I: Civil society organizations play a minimal to zero role during floods as only the government is legally allowed to act.
Statement II: NGOs often possess deep local

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community networks, enabling efficient distribution of relief materials like food and tarpaulins.
Which of the following is correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

88. Consider the following statements regarding the Pradhan Mantri Fasal Bima Yojana (PMFBY):
Statement I: The maximum premium payable by farmers is 2% for all Kharif food and oilseed crops.
Statement II: The maximum premium payable by farmers is 1.5% for all Rabi food and oilseed crops.
Which of the following is correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

89. What is the primary cause-and-effect benefit of conducting regular disaster mock drills?
(A) Consuming resources to reduce the state budget
(B) Identifying gaps and improving coordination
(C) Triggering minor disasters to test building strength
(D) Bypassing the requirements of disaster legislation

90. Which of the following is NOT a fundamental component of an effective Early Warning System (EWS)?
(A) Post-disaster Reconstruction
(B) Risk Knowledge
(C) Monitoring and Warning Service
(D) Dissemination and Communication

91. Lightning strikes occur most violently in which type of clouds?
(A) Stratus
(B) Cumulonimbus
(C) Cirrus
(D) Altostratus

92. Flood control in the Chambal river basin is partially managed through a cascade of large dams. Which of the following is NOT a dam located on the Chambal River?
(A) Gandhi Sagar
(B) Rana Pratap Sagar
(C) Bargi Dam
(D) Jawahar Sagar

93. What is the cause-and-effect relationship between rapid deforestation and landslides in hilly regions?
(A) Deforestation increases soil fertility and weight
(B) Deforestation reduces rainfall, causing dry slides
(C) Trees cause earthquakes, so removal prevents them
(D) Root removal decreases soil cohesion and stability

94. Identify the correct pair regarding the roles designated under the Incident Response System (IRS).
(A) Safety Officer - Responsible for purchasing relief materials
(B) Information Officer - Responsible for deploying medical teams
(C) Liaison Officer - Acts as a point of contact for agencies
(D) Operations Section Chief - Manages all financial accounts

95. Consider the following statements regarding the implementation of the Pradhan Mantri Fasal Bima Yojana (PMFBY):
Statement I: The scheme is implemented directly by the district administration without any insurance companies.
Statement II: The scheme is implemented through empanelled General Insurance Companies selected by the State Government through a bidding process.
Which of the following is correct?
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true but Statement II is false.
(D) Statement I is false but Statement II is true.

96. Which of the following is an incorrect statement regarding Madhya Pradesh's vulnerability to earthquakes?
(A) The state lies mainly in Seismic Zones II and III

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(B) Bhopal and Indore are situated in Seismic Zone V
(C) The Narmada-Son lineament is an active fault line
(D) Jabalpur experienced a major earthquake in 1997

97. What is the most appropriate primary objective of adopting the Incident Response System (IRS) in a State Disaster Management Plan?
(A) To provide a systematic approach for seamless response
(B) To eliminate the role of the District Collector entirely
(C) To permanently transfer state disaster funds to the center
(D) To ensure media gets exclusive rights to the footage

98. Which of the following is NOT typically considered a contributing factor to the severity of heat waves in central India?
(A) Depletion of green cover and urbanization
(B) Active occurrence of La Niña, which usually brings cooling rains
(C) Anti-cyclonic atmospheric circulation patterns over the region
(D) Occurrence of El Niño in the Pacific Ocean

99. The recurrence of severe droughts prompted special assistance packages for specific regions. Which region was the focus of a dedicated "Drought Mitigation Package" approved by the government in the late 2000s?
(A) Malwa
(B) Nimar
(C) Mahakoshal
(D) Bundelkhand

100. In disaster risk reduction, what does the term "resilience" fundamentally mean?
(A) The ability to prevent any natural hazard from occurring
(B) The process of migrating populations away from coasts
(C) The reliance solely on international aid after a disaster
(D) The ability of a system to recover from a hazard's effects

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ANSWERS

1. (A) I and II only
India's seismic zoning map divides the country into four distinct regions based on historical activity and geological vulnerability. Seismic Zone V represents the areas most susceptible to high-intensity earthquakes. While Madhya Pradesh is prone to moderate activity in specific regions, no part of the state is officially classified under the highest category, which is Seismic Zone V.

2. (C) Damage from nuclear risks or acts of war
The Pradhan Mantri Fasal Bima Yojana offers insurance protection to farmers against various natural calamities affecting crop yields. However, the scheme explicitly excludes damages resulting from specific man-made or catastrophic global events. Losses caused by nuclear hazards, acts of war, or hostile actions are among the primary exclusions under the standard operational guidelines provided to participating insurance providers.

3. (C) Industrial chemical spills
Natural disasters are catastrophic events caused by environmental factors such as tectonic movements, atmospheric disturbances, or hydrological imbalances. Major earthquakes, tropical cyclones, and seasonal floods are classic examples of such phenomena. In contrast, industrial chemical spills are categorized as human-made or technological disasters, as they result from human error, mechanical failure, or lack of safety protocols.

4. (C) Mitigation, Preparedness, Response, Recovery
The disaster management cycle consists of a logical sequence of stages designed to reduce impacts and ensure systematic relief. It begins with mitigation to reduce long-term risks, followed by preparedness for upcoming threats. Once an event occurs, the focus shifts to immediate response for life-saving activities, finally concluding with the recovery phase to restore the community.

5. (A) Both A and R are true and R is the correct explanation of A.
Forests play a vital role in managing the hydrological cycle by acting as natural sponges that absorb rainwater. When trees are removed, the soil loses its capacity to infiltrate water effectively, leading to rapid surface runoff into river channels. This increased volume of water overwhelms river banks, significantly raising the frequency and severity of destructive floods downstream.

6. (B) Seismic tremor
Climate-related disasters are those triggered by atmospheric conditions and weather patterns. Heat waves, hailstorms, and droughts are directly linked to temperature and precipitation fluctuations within the state. Seismic tremors, however, are geophysical events caused by the movement of tectonic plates or volcanic activity. They originate from deep within the earth's crust rather than being influenced by climate.

7. (B) Risk = Hazard x Vulnerability
In disaster management theory, risk represents the potential for loss based on the interaction of environmental and social factors. A hazard is a potentially damaging physical event, while vulnerability describes the susceptibility of a community to that specific event. The mathematical product of these two components determines the overall level of disaster risk facing a particular population or region.

8. (B) Severe Droughts
The Bundelkhand region experiences chronic water stress due to a combination of low seasonal rainfall and a lack of perennial water sources. Its unique hard rock geology prevents efficient groundwater recharge, leading to frequent hydrological and agricultural failures. This persistent lack of moisture has turned severe droughts into a recurring crisis, impacting local livelihoods and the regional economy.

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9. (B) Falling ice stones destroying plant structures
Hailstorms represent a significant threat to agriculture because of the physical force exerted by falling ice pellets. These frozen stones strike standing crops with high velocity, shredding leaves, breaking stems, and shattering seed heads. Unlike waterlogging or frost, the primary damage from hailstorms is mechanical in nature, leading to rapid and often irreversible destruction of the seasonal harvest.

10. (C) The Vindhyan-Satpura ranges
Landslides are most likely to occur in areas characterized by steep slopes and weathered rock formations. In Madhya Pradesh, the mountain systems of the Vindhyan and Satpura ranges provide the necessary topographical conditions for such events. During periods of intense monsoon rainfall, the saturated soil on these slopes can lose stability, resulting in localized but destructive sliding movements.

11. (A) P-1, Q-2, R-3, S-4
Different disasters are managed by specific nodal ministries at the central level to ensure specialized response. The Ministry of Home Affairs oversees earthquakes, while the Ministry of Jal Shakti manages flood-related issues. Cyclones fall under the Ministry of Earth Sciences due to their meteorological nature, and the Ministry of Health handles public health emergencies and widespread biological epidemics.

12. (C) P-1, Q-2, R-3, S-4
Seismic science uses specific terms to describe earthquake characteristics. The focus is the underground point where energy is released, while the epicenter is the surface location directly above it. Instruments used to record these vibrations are known as seismographs. The Richter scale is then utilized to quantify the total energy released, providing a numerical magnitude of the event.

13. (A) Sheopur - Tsunami
Disaster vulnerability is determined by the geographic features of a region. Jabalpur is near active fault lines, and Narmadapuram is prone to riverine flooding. Datia often faces drought due to low rainfall. However, Sheopur is a landlocked district in central India, making it physically impossible for it to be affected by a tsunami, which is a coastal phenomenon.

14. (C) Seasonal rainfall is less than seventy-five percent of the long-term average
Droughts are classified based on the specific type of water deficiency being observed. A meteorological drought is officially identified when there is a substantial deficit in precipitation compared to historical norms. In the Indian context, this is generally triggered when the actual seasonal rainfall falls below seventy-five percent of the calculated long-term average for a specific geographic area or station.

15. (A) Both Statement I and Statement II are true.
Lightning is a powerful natural electrical phenomenon that causes more casualties in Madhya Pradesh than many other weather events. It results from the buildup of electrical charges within cumulonimbus clouds, leading to a massive discharge between oppositely charged regions. This discharge can occur between clouds or strike the ground directly, posing a lethal risk to people in open areas.

16. (A) A catastrophic event from natural or human causes that exceeds local community coping capacity
A disaster is formally defined not just by the occurrence of a hazard, but by its impact on society. It represents a serious disruption where the magnitude of loss to life, property, and the environment is so great that the affected population cannot recover using its own resources alone. This necessity for external assistance is the key defining feature of disasters.

17. (A) MP is unaffected by cold waves due to its latitude
Cold waves are characterized by a significant drop in minimum temperatures, often affecting northern and central India during the winter months. Contrary to the idea of being unaffected, Madhya Pradesh frequently experiences these conditions when cold air masses move southward from the Himalayas. Such events can lead to frost formation, which causes extensive damage to winter crops like mustard.

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before summer
(C) Relocating all wildlife to urban zoos during the season
(D) Paving the forest floor to prevent organic combustion

69. Identify the correct pair representing one of the core targets of the Sendai Framework for Disaster Risk Reduction (2015-2030).
(A) Target A - Substantially reduce global mortality
(B) Target B - Increase the number of active volcanoes
(C) Target C - Completely stop all urban-rural migration
(D) Target D - Reduce global temperatures by five degrees

70. Which agronomic measure is most appropriate to mitigate the impact of agricultural drought in drought-prone districts of Madhya Pradesh?
(A) Promoting cultivation of water-intensive sugarcane
(B) Adopting micro-irrigation and resistant crop varieties
(C) Encouraging use of chemicals to accelerate plant growth
(D) Completely abandoning all regional agricultural activities

71. Which of the following most accurately describes "vulnerability" in disaster management?
(A) Community characteristics that increase susceptibility
(B) The physical intensity of a specific natural hazard
(C) The financial budget allocated for post-disaster recovery
(D) The speed of the wind during a severe cyclonic storm

72. The Tapti river basin is prone to flooding. Which prominent district in Madhya Pradesh is significantly vulnerable to floods along the Tapti river?
(A) Gwalior
(B) Burhanpur
(C) Rewa
(D) Panna

73. Find the odd one out regarding the designated functions of the National Disaster Response Force (NDRF).
(A) Specialized search and rescue operations
(B) Medical first response during a disaster event
(C) Assisting in chemical and biological disasters
(D) Long-term economic rehabilitation of victims

74. A "Severe Heat Wave" in the plains is declared when the maximum temperature departure from normal is:
(A) Over 2.0 degrees Celsius
(B) Over 3.5 degrees Celsius
(C) Over 4.5 degrees Celsius
(D) Over 6.4 degrees Celsius

75. Which of the following equations accurately reflects the conceptual framework of disaster risk considering human intervention?
(A) Disaster Risk = (Hazard + Vulnerability) × Capacity
(B) Disaster Risk = Capacity / (Hazard × Vulnerability)
(C) Disaster Risk = (Capacity × Vulnerability) / Hazard
(D) Disaster Risk = (Hazard × Vulnerability) / Capacity

76. In the event of a sudden disaster like an earthquake or flash flood, who is invariably the first responder?
(A) National Disaster Response Force (NDRF)
(B) The State Chief Minister
(C) United Nations Relief Teams
(D) The local affected community

77. According to standard State Disaster Response Fund (SDRF) norms, what is the usual baseline ex-gratia relief provided to the next of kin for loss of life due to a notified disaster?
(A) Rs. 1 Lakh
(B) Rs. 4 Lakhs
(C) Rs. 10 Lakhs
(D) Rs. 20 Lakhs

78. Which geological feature significantly contributes to the groundwater scarcity

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27. (A) Heavy secondary rainfall leading to inland flooding
Although Madhya Pradesh is landlocked and does not experience direct coastal storm surges, it is significantly affected by the remnants of tropical cyclones. As these systems move inland from the Bay of Bengal or the Arabian Sea, they often bring intense and prolonged precipitation. This heavy secondary rainfall can cause sudden rises in river levels, leading to widespread inland flooding.

28. (A) They occur mainly in the Narmada, Tapti, and Chambal basins during heavy monsoons
Flood vulnerability in Madhya Pradesh is primarily concentrated along the major river valleys that drain the state. During the peak monsoon season, heavy rainfall in the catchment areas of the Narmada, Tapti, and Chambal rivers can lead to severe inundation of the surrounding plains. These events are driven by excess surface runoff rather than glacial melts or coastal storm surges.

29. (C) Maturing and harvesting of Rabi crops
Hailstorms in Madhya Pradesh are most frequent during the late winter and early spring months. This timing coincides with the final maturing and harvesting stages of the Rabi crop season, which includes vital crops like wheat and gram. The physical impact of ice pellets on nearly ripe crops causes maximum economic damage, as it destroys the season's entire investment.

30. (D) Meteorological drought
Drought is a progressive phenomenon that typically begins with a significant shortfall in seasonal precipitation. This initial lack of rainfall is known as a meteorological drought. If the dry period persists, it eventually leads to the depletion of surface water and soil moisture, triggering hydrological and agricultural droughts. Therefore, the atmospheric deficit serves as the primary trigger for all subsequent categories.

31. (C) Private security agency staff
The State Disaster Response Force is a specialized government entity designed to handle emergency rescue operations. It is composed of personnel drawn from established public services such as the State Police, the Special Armed Force, and the Home Guards. These members receive advanced training in disaster response. Private security agency staff are not officially integrated into this formal state government force.

32. (B) By providing technical assistance and supporting policies
International organizations like the United Nations Development Programme support disaster management by sharing global best practices and scientific expertise. Their primary role involves assisting state governments in developing robust disaster management plans, improving risk assessment methodologies, and building institutional capacity. They focus on long-term policy support and technical guidance rather than directly managing local administration or providing military rescue forces.

33. (A) I, II, III and V only
The National Disaster Management Authority was established by the Disaster Management Act of 2005 as the apex policy-making body. It is chaired by the Prime Minister and includes up to nine nominated members. While it lays down essential policies and guidelines, it does not maintain its own permanent armed troops; instead, it utilizes specialized forces like the NDRF.

34. (A) P-1, Q-2, R-3, S-4
India utilizes various space-based technologies to enhance disaster management capabilities. INSAT satellites provide essential meteorological data for weather forecasting, while the IRS series focuses on high-resolution mapping for resource monitoring. NavIC offers precise positioning data for navigation and search operations. Finally, Bhuvan serves as a comprehensive geoportal, allowing for the visualization and analysis of spatial data during emergencies.

35. (A) To ensure a coordinated management by integrating agencies
The Incident Response System is a standardized management framework designed to improve the efficiency of emergency operations. Its primary goal is to provide a clear organizational structure that integrates multiple responding agencies under a single command. This ensures that resources are deployed effectively, communication is streamlined, and the overall

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providing immediate relief because they possess deep local connections and flexible operational styles. They can quickly mobilize resources and distribute basic necessities like food, clothing, and tarpaulins to affected families, filling critical gaps in the official government response during major emergencies.

88. (A) Both Statement I and Statement II are true.
The Pradhan Mantri Fasal Bima Yojana is designed to keep insurance affordable for all farmers. To achieve this, the government has capped the premium rates at very low levels. For all Kharif food and oilseed crops, the maximum premium a farmer pays is two percent of the sum insured. For Rabi crops, this rate is further reduced to just one point five percent, with the government covering the remainder.

89. (B) Identifying gaps and improving coordination
Disaster mock drills are simulated emergency exercises designed to test the effectiveness of existing response plans. By practicing these scenarios, authorities can identify weaknesses in communication, resource deployment, and inter-agency cooperation before a real disaster occurs. This process ensures that all participants are familiar with their roles and that the coordination between different departments is smooth, ultimately leading to a more efficient and life-saving response during actual crises.

90. (A) Post-disaster Reconstruction
A complete early warning system must include four key pillars: knowledge of the risks, scientific monitoring of hazards, clear communication of warnings, and the ability of the community to respond. These components work together to prevent or minimize damage before an event occurs. Post-disaster reconstruction is a separate phase of the disaster management cycle that focuses on recovery after the event, rather than on providing warnings for future threats.

91. (B) Cumulonimbus
Lightning is a powerful atmospheric discharge that occurs primarily within cumulonimbus clouds. These clouds are characterized by their massive vertical extent and violent internal updrafts, which cause ice crystals and water droplets to collide and create static electrical charges. When the electrical potential between different parts of the cloud or the ground becomes too great, it results in the brilliant flash of light and heat known as lightning.

92. (C) Bargi Dam
The Chambal River is managed through a series of major reservoirs that provide both irrigation and flood control. The Gandhi Sagar, Rana Pratap Sagar, and Jawahar Sagar dams are all situated on the Chambal and form a vital cascade system. The Bargi Dam, however, is located on the Narmada River near Jabalpur. It is part of a different river system and does not contribute to the management of the Chambal basin.

93. (D) Root removal decreases soil cohesion and stability
Trees and vegetation play a critical role in stabilizing hillsides. The extensive root systems of trees act like biological anchors, binding the soil together and increasing its overall cohesion. When forests are cleared, this natural support is lost, leaving the soil loose and vulnerable. During heavy rains, the saturated and unsupported soil can easily give way, leading to frequent and more severe landslides in the affected hilly regions.

94. (C) Liaison Officer - Acts as a point of contact for agencies
The Incident Response System defines specific roles to ensure a structured command. The Liaison Officer is the primary point of contact for representatives from assisting and cooperating agencies. This role is crucial for maintaining clear communication between the main response team and outside organizations. Other roles, such as the Safety Officer or Operations Chief, have distinct responsibilities related to on-site safety and tactical execution of the response plan, respectively.

95. (D) Statement I is false but Statement II is true.
The Pradhan Mantri Fasal Bima Yojana is an insurance-based scheme that involves a partnership between the government and the private sector. While the state government oversees the program, the actual insurance coverage is provided by general insurance companies. these companies are selected through a competitive bidding process at the state level. This allows for professional risk management

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their own safety. It recognizes that local residents are the first responders when a disaster strikes and possess valuable traditional knowledge. By empowering communities to identify risks and develop local action plans, the overall vulnerability of the region can be significantly and sustainably reduced.

45. (B) To ensure structural safety and promote disaster education
The School Safety Programme is designed to protect children by making educational environments more resilient. It focuses on assessing and improving the structural integrity of school buildings to withstand earthquakes or floods. Additionally, the program promotes disaster education by training students and staff in emergency drills, ensuring they know exactly how to react and stay safe during a crisis.

46. (B) Destructive high-velocity water rising within a few hours
Flash floods in hilly regions are distinct from gradual riverine floods due to their extreme speed and power. They are typically triggered by intense rainfall or cloudbursts on steep terrain, causing water levels to rise dramatically within a very short timeframe. These high-velocity torrents carry debris and rocks, making them highly destructive to roads, bridges, and settlements located along mountain streams.

47. (B) Compensation norms are exclusively decided by the local Gram Panchayat without state guidelines.
Disaster relief and compensation follow strict institutional frameworks to ensure fairness and consistency. While local officials help identify victims, the norms and financial scales for relief are set by state and central governments according to established guidelines. The Gram Panchayat does not have the authority to decide these amounts independently, as funding primarily comes from the State Disaster Response Fund.

48. (C) 2005
The Government of India enacted the Disaster Management Act in late 2005 to provide a comprehensive legal framework for managing emergencies. This legislation was a significant shift from a relief-centric approach to a more proactive strategy focused on prevention and mitigation. It led to the establishment of dedicated authorities at the national, state, and district levels to coordinate all disaster-related activities.

49. (A) WMO - Meteorological and climate-related warnings
Various international organizations have specific mandates to assist in disaster reduction. The World Meteorological Organization is the primary global body responsible for monitoring weather patterns and providing warnings for climate-related hazards like cyclones and floods. Other agencies like WHO and FAO handle health and food security, respectively, but they do not monitor seismic activity or manage urban search and rescue operations.

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50. (C) 2015 to 2030
The Sendai Framework for Disaster Risk Reduction was adopted at the Third United Nations World Conference in Japan. It succeeded the Hyogo Framework and set a global agenda for the fifteen-year period between 2015 and 2030. The framework provides a roadmap for countries to achieve a substantial reduction in disaster risk and losses in lives, livelihoods, and health over this specific timeframe.

51. (A) 2, 1, 4, 3
The Indian Meteorological Department follows a standard four-stage warning system for cyclones to ensure timely preparation. It begins with a Pre-Cyclone Watch to alert officials of a potential storm. This is followed by a Cyclone Alert and then a formal Cyclone Warning as the threat becomes imminent. Finally, a Post Landfall Outlook is issued to manage the lingering inland effects.

52. (D) The Chief Minister of Madhya Pradesh
Under the provisions of the Disaster Management Act, every state must establish a State Disaster Management Authority to oversee emergency planning and response. In Madhya Pradesh, the Chief Minister serves as the ex-officio Chairperson of this authority. This ensures that disaster management receives the highest level of political priority and that all state departments can be coordinated effectively during a major crisis.

response is coordinated without the confusion of overlapping jurisdictional roles.

36. (A) They provide support for relief, rescue, and mobilization
Non-governmental organizations and civil society groups are vital partners in the disaster management process. Because they often have deep roots within local communities, they can mobilize volunteers quickly and distribute relief materials like food and medicine effectively. While they do not have the legal authority to declare disasters or manage law and order, their support is essential for successful grass-roots recovery.

37. (A) Rainfall of 100 mm or more per hour in a local area
A cloudburst is an extreme meteorological event characterized by intense and sudden precipitation over a very small geographic area. It is officially defined by meteorologists as a rainfall event where at least one hundred millimeters of rain falls within a single hour. Such high intensity often leads to devastating flash floods and debris flows, especially in hilly or mountainous terrains.

38. (D) Global disaster mortality by 2030
The Sendai Framework for Disaster Risk Reduction is a global agreement that sets specific targets to be achieved by the year 2030. One of its most critical objectives is to substantially reduce the number of deaths caused by disasters worldwide. By focusing on better preparedness and risk reduction, the framework aims to lower the average global mortality rate per hundred thousand people.

39. (D) Electron Microscopes
Effective disaster management relies on advanced technologies for early warning and damage assessment. Remote sensing satellites and Geographic Information Systems are used for mapping vulnerabilities, while Doppler weather radars provide precise tracking of storms and precipitation. Electron microscopes, however, are laboratory instruments used to visualize extremely small biological or material structures and have no direct application in managing large-scale disasters.

40. (A) P-1, Q-2, R-3, S-4
The Disaster Management Act of 2005 established a tiered institutional structure across the country. Chapter II details the creation of the National Disaster Management Authority at the central level. Chapter III and Chapter IV mandate the formation of State and District Disaster Management Authorities, respectively. Finally, Chapter VII provides for the constitution of the National Disaster Response Force for specialized operations.

41. (B) Loss of biodiversity and degradation of soil quality
Frequent forest fires have devastating long-term impacts on the ecology of national parks. The high temperatures destroy the organic layer of the soil and kill essential microorganisms, leading to significant soil degradation. Furthermore, these fires wipe out diverse plant and animal species, disrupting the delicate natural balance and resulting in a permanent loss of regional biodiversity within the forest ecosystem.

42. (A) 1, 2, 3, 4
The Incident Response System follows a hierarchical structure to manage emergency operations efficiently. At the top is the Incident Commander, who has overall responsibility. The Operations Section executes the tactical response, while the Planning Section prepares action plans and tracks resources. The Logistics Section supports the operation by providing necessary supplies and services, ensuring a smooth flow from command to execution.

43. (D) None of the above
The Sendai Framework outlines four specific priorities for action to reduce disaster risks globally. These include understanding the nature of risks, strengthening governance for effective management, investing in resilience for reduction, and enhancing preparedness for a better response and recovery. Since all four descriptions provided are consistent with the framework's official priorities, none of the combinations listed are actually incorrect.

44. (D) Community Based Disaster Risk Reduction
Community Based Disaster Risk Reduction is a philosophy that emphasizes the active involvement of local populations in managing

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movement of the earth's crust and is associated with earthquakes or volcanoes. It is not used to describe or classify any form of drought phenomenon.

62. (C) Statement I is true but Statement II is false.
The State Disaster Response Force in Madhya Pradesh is primarily staffed by personnel from the Home Guards and State Police who receive specialized rescue training. Contrary to being prohibited, the SDRF is actively encouraged to conduct mock drills in schools and public places. These drills are essential for educating the public and testing the readiness of both the responders and the community.

63. (A) Both A and R are true and R is the correct explanation of A.
Large dams are vital for flood management because they can store excess rainwater during peak monsoons, preventing downstream rivers from overflowing. However, if these reservoirs reach their maximum capacity, authorities may be forced to release large volumes of water suddenly. If this release is not carefully managed or timed, it can unintentionally cause or worsen flooding in the downstream river basin.

64. (C) Issuing early warnings for incoming cyclones
Rehabilitation is a post-disaster phase aimed at restoring the lives and livelihoods of affected populations. This includes providing medical care, rebuilding local economies, and offering social support to vulnerable individuals like orphans. Issuing early warnings, however, is a component of disaster preparedness. It takes place before an event occurs to prevent loss, rather than as part of the recovery process after the event.

65. (A) Poor planning and choking of natural drainage systems
Urban flash floods in cities like Indore and Bhopal are often caused by human factors rather than natural tectonic or glacial changes. Rapid and unplanned urbanization frequently leads to the encroachment of natural water bodies and the blocking of traditional drainage channels. During heavy rainfall, the water has no clear path to escape, resulting in sudden and destructive flooding of residential areas.

66. (A) Infectious disease pandemic
Disasters can be categorized by their physical origin. Earthquakes, landslides, and tsunamis are all geological or geophysical disasters caused by the movement of the earth's crust or underwater disturbances. In contrast, an infectious disease pandemic is a biological disaster. It is caused by the spread of pathogens among human populations and is governed by different scientific principles than the mechanical movements of the earth.

67. (B) Damini
The Damini mobile application was developed by the Indian Institute of Tropical Meteorology to address the high number of lightning-related casualties in India. The app uses a network of sensors to track electrical activity in the atmosphere and provides users with location-specific warnings. By alerting individuals about incoming lightning strikes, it allows them enough time to seek safe shelter and avoid potential injury.

68. (B) Creating and clearing physical fire lines before summer
Fire lines are a standard and effective management tool used by forest departments to prevent the spread of wildfires. These are wide strips of land within the forest where all flammable vegetation is cleared away. By breaking the continuity of the organic material on the forest floor, fire lines act as a physical barrier that stops a fire from moving from one section to another.

69. (A) Target A - Substantially reduce global mortality
The Sendai Framework is structured around seven global targets designed to measure progress in disaster risk reduction. Target A specifically focuses on the human cost of disasters, aiming for a significant reduction in global mortality. This involves improving early warning systems and infrastructure resilience to ensure that fewer people lose their lives during catastrophic events like earthquakes, floods, or severe storms.

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70. (B) Adopting micro-irrigation and resistant crop varieties
Mitigating the impact of agricultural drought requires strategies that maximize water efficiency. Micro-irrigation techniques, like drip or sprinkler systems, deliver water directly to the plant roots,

CHAPTER 13
Basic Computer Knowledge and Hardware

1. Based on size and processing power, which classification of computer is primarily used by large organizations for bulk data processing, such as census and enterprise resource planning?
(A) Minicomputer system
(B) Microcomputer setup
(C) High-end workstation
(D) Mainframe

2. The Central Processing Unit (CPU) is often called the brain of the computer. Which of the following are the core internal components of a basic CPU?
(A) RAM, ROM, and Motherboard
(B) Hard Disk, Cache, and System Bus
(C) Control Unit, Arithmetic Logic Unit, and Registers
(D) BIOS, CMOS, and Chipset

3. Which of the following is considered a primary limitation of traditional computer systems?
(A) Inability to perform iterative tasks with high efficiency
(B) High error rate in complex mathematical calculations
(C) Lack of inherent IQ and heuristic learning ability
(D) Incapacity to store large volumes of structured data

4. In processor architecture, what is the specific role of the Program Counter (PC) register?
(A) Stores results of the most recent calculation
(B) Counts active programs running in the system
(C) Holds memory addresses of upcoming instructions
(D) Holds instructions currently being decoded

5. Find the odd one out among the following examples based on their data processing mechanisms:
(A) Traditional mercury thermometer
(B) Digital smart watch
(C) Slide rule
(D) Vehicle speedometer (mechanical)

6. Which of the following statements identifies a key characteristic of Random Access Memory (RAM)?
(A) It permanently stores the system's BIOS instructions.
(B) It is volatile and loses its contents when power is disconnected.
(C) It is non-volatile and retains data when power is turned off.
(D) It provides sequential access to stored data.

7. What is the fundamental characteristic of a computer that ensures it produces accurate results consistently without suffering from fatigue or lack of concentration?
(A) Versatility
(B) Diligence
(C) Speed
(D) Automation

8. The fundamental concept that both computer programs and their associated data must be stored in the same computer memory for processing is known as:
(A) Parallel processing architecture
(B) Stored-program concept
(C) Harvard architecture
(D) Multithreading architecture

9. What is the specific function of the Arithmetic Logic Unit (ALU) within a microprocessor?
(A) Directing the flow of data between memory and registers
(B) Performing mathematical calculations and logical comparisons
(C) Supplying continuous power to the motherboard components
(D) Storing operating system files for quick access

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NDMA in its day-to-day functions. While the Prime Minister chairs the NDMA, the Executive Committee is headed by the Union Home Secretary. This committee is responsible for coordinating the implementation of national policies across various ministries and ensuring that the government's disaster response operations are carried out in a systematic and efficient manner.

80. (D) Pre-monsoon and active monsoon thunderstorms
Lightning is a phenomenon associated with the formation of massive cumulonimbus clouds, which are most common during the pre-monsoon and active monsoon months. In Madhya Pradesh, the transition periods of high heat and moisture create the perfect atmospheric conditions for these violent thunderstorms. The resulting lightning strikes pose a significant threat to life and property during these specific seasonal windows rather than during the winter.

81. (B) A 10-fold increase in amplitude
The Richter scale is a logarithmic measurement used to describe the magnitude of an earthquake. Because of its mathematical nature, every whole number increase on the scale represents a ten-fold increase in the measured amplitude of the seismic waves. For example, a magnitude seven earthquake has waves with ten times the amplitude of a magnitude six event, though the energy release increases by a much larger factor.

82. (A) Mitigation - The post-disaster distribution of food packets
Mitigation refers to the proactive measures taken before a disaster occurs to reduce its long-term impact, such as building stronger houses or planting trees. It is a pre-disaster activity focused on risk reduction. In contrast, the distribution of food and relief materials is part of the immediate response or relief phase that takes place after a disaster has already occurred to support the survivors.

83. (D) Hailstorms in Madhya Pradesh are exclusively caused by cyclonic disturbances originating in the Arabian Sea.
Hailstorms in Madhya Pradesh can be triggered by several meteorological factors, including western disturbances and local convective activity during the summer. While cyclonic systems can influence weather, they are not the sole cause of hail. These storms are particularly damaging during the harvest season because the physical impact of ice pellets can destroy standing crops, leading to severe economic losses for farmers across the state.

84. (C) By mapping inundation and identifying vulnerable zones
Geographic Information Systems are powerful tools for spatial analysis and planning. In the Chambal basin, GIS technology is used to combine topographical data with historical rainfall records to create detailed flood maps. These maps identify exactly which areas are likely to be submerged during high river flows. This information allows authorities to restrict construction in high-risk zones and plan more effective evacuation routes for the local population.

85. (C) Sudden flash floods and localized landslide events
Because cloudbursts deliver an extraordinary amount of water in a very short time, they create immediate and dangerous environmental consequences. In the hilly regions of Madhya Pradesh, this sudden volume of water overwhelms small streams, leading to destructive flash floods. The water also saturates the soil on steep slopes, which can trigger localized landslides. These events are characterized by their sudden onset and high intensity within a small area.

86. (B) Public awareness campaigns
Structural mitigation involves the physical construction of infrastructure designed to resist or divert the forces of a hazard. Examples include building dams, embankments, and sea walls. In contrast, public awareness campaigns are considered non-structural measures. They focus on changing human behavior and improving knowledge through education and training, which reduces vulnerability without the need for physical construction or engineering works on the landscape.

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87. (D) Statement I is false but Statement II is true.
Civil society organizations and NGOs are vital participants in disaster management, often working alongside the government. Far from having no role, these groups are essential for

53. (C) To act as the Chairperson of the local DDMA
The District Collector plays a pivotal role in the decentralized disaster management structure of India. As the administrative head of the district, the Collector serves as the Chairperson of the District Disaster Management Authority. In this capacity, they are responsible for preparing local disaster management plans, coordinating between different departments, and leading the immediate response efforts whenever a disaster occurs locally.

54. (C) Bhuvan
Bhuvan is a sophisticated geoportal developed by the Indian Space Research Organisation that provides high-resolution satellite imagery of the Indian subcontinent. It is an invaluable tool for disaster management, allowing authorities to map vulnerable areas, monitor the progress of disasters like floods or forest fires in real-time, and assess the extent of damage to infrastructure after an event has taken place.

55. (A) Yokohama Strategy, Hyogo Framework, Sendai Framework
Global efforts to manage disaster risks have evolved through three major international agreements. The journey began with the Yokohama Strategy in 1994, which emphasized the importance of prevention. This was followed by the more comprehensive Hyogo Framework for Action in 2005. The current global standard is the Sendai Framework, adopted in 2015, which focuses on strengthening risk governance and resilience.

56. (A) Ministry of Home Affairs
The National Disaster Response Force was created to provide a specialized response to natural and man-made disasters. Although it is composed of personnel from various Central Armed Police Forces, it functions under the administrative control of the Ministry of Home Affairs. This ministry is responsible for the overall internal security and disaster management policies of the Indian government at the national level.

57. (B) II and V only
Modern post-disaster policies focus on holistic recovery through the principle of "Building Back Better." This includes restoring livelihoods and reconstructing resilient housing while actively involving the local community in the process. Effective rehabilitation must also address the psychological trauma of survivors. Therefore, statements suggesting that psychological support should be ignored or that community participation should be discouraged are fundamentally incorrect.

58. (A) It provides a framework for vulnerability analysis and recovery
The Madhya Pradesh State Disaster Management Plan is a comprehensive document that outlines the state's strategy for managing various hazards. It includes a detailed analysis of regional vulnerabilities and sets up a clear framework for response and long-term recovery. The plan is designed to coordinate with district-level plans and utilizes both state and national resources rather than relying solely on international funding.

59. (C) Statement I is true but Statement II is false.
Climate change is a global phenomenon that significantly alters weather patterns, leading to more frequent and intense extreme events. Madhya Pradesh is not insulated from these changes; in fact, the state has witnessed rising temperatures and increasingly erratic monsoon cycles. While forest cover provides some environmental benefits, it cannot completely protect the region from the broader impacts of a changing global climate.

60. (B) II and III only
Effective early warning systems are proactive tools designed to provide alerts well before a disaster strikes, allowing for timely evacuation. These systems rely on scientific monitoring, clear communication, and community response capabilities. In India, the Central Water Commission is the official body responsible for flood forecasting. However, the claim that warnings only occur after a disaster is a complete misunderstanding of their purpose.

61. (C) Tectonic Drought
Droughts are classified based on the specific system they affect, such as the atmosphere, the water cycle, or agriculture. Meteorological, hydrological, and agricultural droughts are well-recognized categories in environmental science. However, the term "tectonic" refers to the

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and the efficient processing of claims for farmers who suffer significant crop losses.

96. (B) Bhopal and Indore are situated in Seismic Zone V
Madhya Pradesh is historically characterized by moderate seismic activity, especially along the Narmada-Son lineament. Significant earthquakes have occurred in the past, most notably in Jabalpur in 1997. However, no part of the state, including major urban centers like Bhopal and Indore, is classified under the extremely high-risk Seismic Zone V. Most districts in the state fall within the lower-risk categories of Seismic Zone II or moderate-risk Seismic Zone III.

97. (A) To provide a systematic approach for seamless response
The adoption of the Incident Response System is intended to eliminate the confusion that often occurs during the initial stages of a disaster. By providing a clear and flexible organizational structure, the IRS ensures that all responding agencies can work together toward common objectives. This systematic approach allows for a more seamless transition from planning to execution, ensuring that resources are used effectively and that the overall response is professionally managed.

98. (B) Active occurrence of La Niña, which usually brings cooling rains
Heat waves in central India are influenced by several large-scale atmospheric and environmental factors. Urbanization and the loss of green cover create heat islands, while anti-cyclonic patterns prevent the cooling effects of wind and clouds. El Niño events are also often linked to hotter and drier conditions. In contrast, La Niña is generally associated with cooler temperatures and increased rainfall in the Indian subcontinent, which helps to mitigate rather than worsen heat waves.

99. (D) Bundelkhand
Due to its history of recurring water scarcity and agricultural distress, the Bundelkhand region received a special Drought Mitigation Package in the late 2000s. This package was designed to address the unique geological and climate challenges of the area by funding water conservation projects, improving irrigation infrastructure, and promoting sustainable farming practices. It aimed to provide long-term resilience for the local population against the persistent threat of hydrological and agricultural droughts.

100. (D) The ability of a system to recover from a hazard's effects
In the context of disaster management, resilience is the capacity of a community or system to absorb a shock and return to its original state or improve upon it. It goes beyond mere survival, focusing on how quickly and effectively people can rebuild their lives and infrastructure after an event. A resilient system is one that is prepared, has strong social networks, and possesses the resources needed for a successful and rapid recovery.

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significantly reducing waste. Additionally, planting crop varieties that are naturally resistant to dry conditions helps ensure a harvest even when rainfall is low. These proactive agronomic measures are essential for maintaining food security in water-stressed regions.

71. (A) Community characteristics that increase susceptibility
Vulnerability refers to the internal factors that make a community more likely to suffer damage when a hazard strikes. These can include physical factors like poor building construction, social factors like poverty, or environmental factors like living in a flood-prone area. Unlike the hazard itself, which is an external event, vulnerability describes the underlying conditions that determine the severity of a disaster's impact.

72. (B) Burhanpur
The Tapti River flows through the southern part of Madhya Pradesh, and its basin is prone to periodic flooding during the monsoon season. Burhanpur is a prominent district located directly along the banks of the Tapti. Its geographical position makes it highly vulnerable to rising river levels, which can inundate low-lying residential areas and agricultural lands during periods of exceptionally heavy precipitation.

73. (D) Long-term economic rehabilitation of victims
The National Disaster Response Force is a specialized emergency unit focused on immediate life-saving actions. Its primary duties include search and rescue operations, providing medical first aid, and managing hazardous material incidents. While the NDRF is critical during the crisis phase, the long-term economic rehabilitation of victims is a separate administrative task handled by the state government and civil authorities through various welfare schemes.

74. (D) Over 6.4 degrees Celsius
The Indian Meteorological Department uses the departure from normal maximum temperatures to categorize heat waves in the plains. A standard heat wave is declared when the departure is between four point five and six point four degrees Celsius. If the maximum temperature exceeds the normal by more than six point four degrees, it is officially classified as a severe heat wave, indicating extreme health hazards.

75. (D) Disaster Risk = (Hazard x Vulnerability) / Capacity
Disaster risk is the result of a complex relationship between environmental threats and human resilience. It is directly increased by the intensity of a hazard and the degree of community vulnerability. Conversely, the capacity of a society to prepare for and respond to these threats acts as a mitigating factor. By increasing capacity through better planning and resources, the overall disaster risk can be effectively lowered.

76. (D) The local affected community
When a disaster strikes suddenly, there is an inevitable time lag before specialized government forces can arrive at the scene. Therefore, the people living in the immediate vicinity are always the first to respond. These local residents perform the initial rescue and relief activities, often saving lives through quick action and local knowledge. Empowering these communities is thus a core strategy in modern disaster management.

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77. (B) Rs. 4 Lakhs
The State Disaster Response Fund provides immediate financial assistance to victims of notified disasters. According to current national norms, the baseline ex-gratia relief for the loss of a human life is fixed at four lakh rupees per deceased person. This amount is intended as immediate support for the next of kin and is typically transferred directly to their bank accounts following official verification of the incident.

78. (D) Hard rock terrain with poor recharge capacity
The hydrological challenges of the Bundelkhand region are deeply rooted in its geological composition. The area is dominated by an ancient shield of hard crystalline rocks that lack the natural pores and fractures needed to store water. As a result, most rainwater quickly runs off the surface instead of soaking into the ground. This lack of natural storage leads to rapid water scarcity and frequent droughts.

79. (B) Union Home Secretary
The Disaster Management Act established a National Executive Committee to assist the

10. In a network environment, a computer that provides centralized resources, data, and services to other computers is known as a:
(A) Client
(B) Node
(C) Server
(D) Terminal

11. Which variant of Read-Only Memory allows data to be erased and reprogrammed multiple times using electrical voltages rather than ultraviolet light?
(A) PROM
(B) EPROM
(C) Mask ROM
(D) EEPROM

12. Match the computer generations in List I with their core switching technologies in List II:
List I: (Computer Generations)
P. First Generation
Q. Second Generation
R. Third Generation
S. Fourth Generation
List II: (Core Switching Technologies)
1. Integrated Circuits (ICs)
2. Vacuum Tubes
3. Microprocessors (VLSI)
4. Transistors
(A) P-2, Q-1, R-4, S-3
(B) P-4, Q-2, R-1, S-3
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-4, R-1, S-2

13. The classic Von Neumann architecture suffers from a performance limitation primarily caused by the shared bus between the CPU and memory. This limitation is commonly known as the:
(A) Von Neumann bottleneck
(B) Memory fragmentation issue
(C) Pipeline stall
(D) Thermal throttling effect

14. What are the three primary functional units that constitute the basic architecture of a modern computer system?
(A) Memory Unit, Network Unit, Graphics Unit
(B) Storage Unit, Power Unit, Display Unit
(C) Input Unit, Processing Unit, Output Unit
(D) Arithmetic Unit, Logic Unit, Bus Unit

15. The specialized CPU register that serves as a temporary storage location for intermediate mathematical and logical results generated by the ALU is called the:
(A) Instruction Register
(B) Memory Address Register
(C) Stack Pointer
(D) Accumulator

16. The principle of GIGO in computer science is primarily related to which of the following characteristics of a computer system?
(A) Accuracy and reliability
(B) Storage capacity
(C) Processing speed
(D) Multitasking capability

17. Which type of high-speed internal connection mechanism links the Arithmetic Logic Unit, Control Unit, and Registers within the CPU itself?
(A) Internal CPU bus
(B) External front-side bus
(C) Peripheral Component Interconnect
(D) Universal Serial Bus

18. A high-performance single-user computer designed for technical or scientific applications, often equipped with advanced graphics capabilities, is best categorized as a:
(A) Workstation
(B) Supercomputer
(C) Server
(D) Embedded computer

19. A processor chip that contains two or more distinct processing units integrated onto a single integrated circuit die is referred to as a:
(A) Serial processor
(B) Quantum processor
(C) Hybrid processor
(D) Multi-core processor

20. Devices that are connected to the central computer system to expand its capabilities, but are not part of the core CPU architecture, are collectively known as:
(A) Peripheral devices
(B) Integrated components
(C) Embedded modules
(D) Primary storage units

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ANSWERS

1. (D) Mainframe
Large-scale computer systems designed for massive data processing tasks are essential for major organizations managing census data or enterprise resources. These systems provide exceptional reliability and security while supporting thousands of concurrent users simultaneously. Their massive processing power distinguishes them from smaller consumer systems or technical workstations used for individual tasks requiring high-performance computing resources.

2. (C) Control Unit, Arithmetic Logic Unit, and Registers
The central processing unit functions through the coordination of three essential internal components. These elements include the unit responsible for mathematical and logical operations, the unit that manages instruction flow and hardware signals, and high-speed storage locations for immediate data. Together, they enable the system to interpret and execute complex computational instructions efficiently during system operation.

3. (C) Lack of inherent IQ and heuristic learning ability
Traditional computing systems are characterized by their strict adherence to pre-programmed instructions and logical rules. Unlike biological intelligence, these machines do not possess natural intuition or the ability to make subjective judgments independently. They rely entirely on human-provided algorithms and data, lacking the inherent capability to learn from experience or adapt to novel situations without external programming.

4. (C) Holds memory addresses of upcoming instructions
Within the processor architecture, a specialized register plays a vital role in managing the execution sequence. It specifically tracks the location of the next instruction to be fetched from memory. By automatically incrementing after each fetch, it ensures the CPU progresses through programs in the correct logical order, maintaining the continuous flow of information processing tasks.

5. (B) Digital smart watch
Devices are often classified based on whether they process data in a continuous or discrete manner. While traditional measuring tools like thermometers and mechanical speedometers represent information through physical variations, modern electronic wearables utilize discrete binary signals. This fundamental difference in data representation separates digital devices from analog instruments that rely on physical magnitudes for their functional measurements.

6. (B) It is volatile and loses its contents when power is disconnected.
Primary system memory serves as a high-speed workspace for the processor to store active data and instructions. A defining characteristic of this memory type is its temporary nature. Since it requires a constant electrical current to maintain stored information, all data is immediately cleared whenever the system is powered down or suffers a sudden electrical interruption.

7. (B) Diligence
Computers demonstrate a unique ability to perform repetitive and complex tasks without any degradation in performance. Unlike humans, they do not experience physical tiredness, boredom, or lapses in concentration regardless of the workload duration. This consistent reliability ensures that every operation is executed with the same level of precision and accuracy from the first task to the last.

8. (B) Stored-program concept
The revolutionary architectural design where both instructions and operational data occupy the same internal memory space allows for greater flexibility. This approach enables a computer to easily switch between different tasks by simply loading a new set of instructions into its memory. It forms the logical foundation for all general-

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(C) Thermal throttling
(D) Hyper-threading

30. Consider the following statements regarding computer architecture and organization:
I. Computer architecture refers to attributes of a system visible to a programmer, such as instruction sets.
II. Computer organization encompasses the hardware details transparent to the programmer, such as control signals.
III. The structural arrangement of components is part of organization, not architecture.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

31. Which specific input technology is widely utilized by educational and recruitment boards to quickly and accurately evaluate multiple-choice objective exam sheets?
(A) Magnetic Ink Character Recognition (MICR)
(B) Optical Character Recognition (OCR)
(C) Optical Mark Recognition (OMR)
(D) Barcode Reader

32. The internal clock speed of a modern Central Processing Unit, which dictates how many cycles it executes per second, is predominantly measured in:
(A) Megabytes (MB)
(B) Gigahertz (GHz)
(C) Terabits per second (Tbps)
(D) Revolutions per minute (RPM)

33. When the CPU searches for a specific piece of data in the cache memory and fails to find it, requiring a fetch from the slower main memory, the event is termed a:
(A) Cache hit
(B) Cache miss
(C) Cache fault
(D) Cache collision

34. Immediately after a computer is powered on, the BIOS initiates a diagnostic testing sequence to verify that essential hardware components are functioning properly. This process is called:
(A) Bootloader
(B) MBR (Master Boot Record)
(C) CMOS Setup
(D) POST (Power-On Self-Test)

35. For printing large-scale, high-quality vector graphics such as engineering blueprints, architectural layouts, and maps, which output device is most appropriate?
(A) Plotter
(B) Daisy-wheel printer
(C) High-speed laser printer
(D) Dot-matrix printer

36. The component inside the computer case that converts high-voltage alternating current (AC) from the wall outlet into low-voltage direct current (DC) for internal parts is the:
(A) Switch Mode Power Supply (SMPS)
(B) Universal Power Supply
(C) Voltage Regulator Module
(D) Uninterruptible Power Supply (UPS)

37. Cache memory significantly improves system performance by predicting which data the CPU will need next. This predictive capability is based on the principle of:
(A) Locality of reference
(B) Dynamic allocation
(C) Parallel pipelining
(D) Virtual memory paging

38. On a computer motherboard, the small circular CMOS battery is primarily responsible for:
(A) Providing emergency backup power to CPUs
(B) Powers RAM modules to prevent data loss
(C) Cools chipset components via active fans
(D) Maintains system time and BIOS settings

39. The amount of data that a system bus can transfer simultaneously in a single clock cycle is directly determined by the:
(A) Direction of the address bus
(B) Frequency of the control bus
(C) Capacity of the cache memory
(D) Width of the data bus

40. Which input device is primarily used by graphic designers and engineers to convert hand-drawn

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21. Consider the following statements regarding primary memory types (SRAM and DRAM):
I. SRAM uses flip-flop circuits to store each bit of data.
II. DRAM requires periodic electrical refreshing to maintain data integrity.
III. SRAM is generally slower and cheaper to manufacture than DRAM.
IV. DRAM is widely used as the primary system memory in personal computers.
Which of the above statement(s) is/are correct?
(A) I, II, and III
(B) II, III, and IV
(C) I, II, and IV
(D) I, III, and IV

22. Artificial Intelligence and Ultra Large Scale Integration (ULSI) are the defining characteristics of which generation of computers?
(A) Second Generation
(B) Fifth Generation
(C) Third Generation
(D) Fourth Generation

23. Given below are two statements, one is labelled as Assertion (A) and the other as Reason (R).
Assertion (A): Medical diagnostic machines like ECG and ultrasound are typically hybrid computers.
Reason (R): They convert continuous analog physiological signals into discrete digital numbers for processing and display.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

24. Which component of the CPU acts as the central coordinator by generating timing and control signals to direct the operation of other hardware units?
(A) Arithmetic Logic Unit
(B) General Purpose Register
(C) System Clock
(D) Control Unit

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25. Arrange the following stages of the standard machine cycle (instruction cycle) in the correct chronological order:
I. Execute the instruction
II. Fetch instruction from memory
III. Store the result
IV. Decode the instruction
(A) II, I, IV, III
(B) II, IV, I, III
(C) IV, II, I, III
(D) I, II, III, IV

26. Who among the following is widely recognized as the first computer programmer for developing an algorithm to run on Charles Babbage's Analytical Engine?
(A) Alan Turing
(B) Herman Hollerith
(C) John von Neumann
(D) Ada Lovelace

27. Which of the following sequences represents the correct order of the computer memory hierarchy from fastest to slowest access speed?
(A) Registers, Cache Memory, Main Memory (RAM), Secondary Storage
(B) Cache Memory, Registers, Main Memory (RAM), Secondary Storage
(C) Registers, Main Memory (RAM), Cache Memory, Secondary Storage
(D) Main Memory (RAM), Registers, Cache Memory, Secondary Storage

28. Which of the following statements best defines an analog computer?
(A) It processes continuously varying physical quantities.
(B) It processes discrete data represented by bits.
(C) It combines digital memory with quantum speed.
(D) It manages precise financial and database records.

29. When a CPU generates excessive heat during intensive computational tasks, it may automatically reduce its clock speed to prevent hardware damage. This protective mechanism is known as:
(A) Overclocking
(B) Undervolting

(B) DVI (Digital Desktop Video Connection)
(C) HDMI (High-Definition Multimedia Interface)
(D) Serial (Legacy External Component Port)

51. To protect a desktop computer from sudden power outages and allow users enough time to safely save their data and shut down, which external device is utilized?
(A) Surge Protector
(B) Step-up Transformer
(C) Generator
(D) Uninterruptible Power Supply (UPS)

52. Optical storage devices like CDs and DVDs read encoded binary data from the disc surface by detecting the reflection of:
(A) Ultrasonic sound waves
(B) Electron beams
(C) Magnetic induction
(D) Low-intensity laser beams

53. Match the printer types in List I with their printing mechanisms in List II:
List I: (Printer Types)
P. Dot Matrix Printer
Q. Inkjet Printer
R. Laser Printer
S. Thermal Printer
List II: (Printing Mechanisms)
1. Sprays tiny droplets of liquid ink
2. Uses a laser beam and dry toner powder
3. Uses heat-sensitive paper
4. Strikes an ink ribbon with a print head
(A) P-4, Q-2, R-1, S-3
(B) P-1, Q-4, R-2, S-3
(C) P-4, Q-1, R-2, S-3
(D) P-2, Q-1, R-4, S-3

54. Consider the following statements regarding the components of a standard system bus:
I. The data bus is bidirectional and carries actual data between components.
II. The address bus is unidirectional and carries memory addresses from the CPU to memory.
III. The control bus is responsible for transferring the operating system files during boot.
Which of the above statement(s) is/are incorrect?
(A) I and II only
(B) II and III only
(C) III only
(D) I only

55. In traditional motherboard architectures, which chipset component directly manages high-speed communications between the CPU, RAM, and the graphics controller?
(A) Northbridge
(B) Southbridge
(C) Super I/O Controller
(D) Baseboard Management Controller

56. Unlike traditional Hard Disk Drives (HDDs) that use spinning magnetic platters, Solid State Drives (SSDs) store data persistently using:
(A) NAND flash memory chips
(B) Optical laser patterns
(C) Magnetic tape spools
(D) Volatile DRAM clusters

57. Consider the following statements regarding UEFI (Unified Extensible Firmware Interface) as a replacement for legacy BIOS:
I. UEFI supports booting from much larger hard drives (over 2 TB).
II. UEFI provides a modern graphical user interface with mouse support.
III. UEFI includes Secure Boot to prevent unauthorized bootloaders and malware.
IV. UEFI completely eliminates the need for an operating system.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) I, III, and IV only
(C) II, III, and IV only
(D) I, II, III, and IV

58. The visual clarity and sharpness of an image displayed on a computer monitor or printed on paper is known as resolution. In printing terminology, it is typically measured in:
(A) Dots per inch (DPI)
(B) Hertz (Hz)
(C) Frames per second (FPS)
(D) Pixels per inch (PPI)

59. The practice of forcing a computer component, such as a CPU or GPU, to run at a higher clock rate than the manufacturer's specified baseline is known as:
(A) Throttling

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artwork, architectural plans, and signatures into a digital format?
(A) Plotter
(B) Trackpad
(C) Biometric scanner
(D) Digitizer tablet

41. A device specifically designed to protect electronic equipment from sudden, temporary increases in electrical voltage is known as a:
(A) Rectifier
(B) Surge protector
(C) Capacitor
(D) Inverter

42. Match the storage devices in List I with their storage technologies in List II:
List I: (Storage Devices)
P. Hard Disk Drive (HDD)
Q. Blu-ray Disc
R. Solid State Drive (SSD)
S. Pen Drive
List II: (Storage Technology)
1. Flash Memory (USB interface)
2. Optical Data Storage
3. Magnetic Storage
4. NAND Flash (SATA/NVMe interface)
(A) P-3, Q-2, R-1, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-3, Q-2, R-4, S-1
(D) P-4, Q-2, R-3, S-1

43. The standard specification that defines the physical dimensions, mounting hole placements, and power supply connectors of a motherboard is known as its:
(A) Architecture
(B) Form factor
(C) Bus width
(D) Socket type

44. The most widely used interface standard for connecting external peripherals to a modern computer is USB. What does USB stand for?
(A) Universal System Bus
(B) Unified Serial Bus
(C) Unidirectional Synchronous Bus
(D) Universal Serial Bus

45. The low-level software that initializes computer hardware and bridges the gap between the operating system and hardware components is generally stored in:
(A) Hard Disk Drive
(B) Static RAM
(C) ROM or Flash Memory chip
(D) CPU Cache

46. In modern multi-core processors, which level of cache memory is typically the largest in capacity but the slowest in access speed, and is shared among all CPU cores?
(A) L1 cache
(B) L2 cache
(C) L3 cache
(D) L4 cache

NODIA

47. Why is the address bus in a computer's architecture strictly unidirectional?
(A) Addresses only flow toward input devices
(B) Only the CPU generates target locations
(C) Bidirectional cables cause signal interference
(D) The data bus manages reverse addressing

48. Consider the following hardware input devices:
I. Trackball
II. Joystick
III. Light Pen
IV. Digitizing Tablet
V. Touchpad
Which of the above are pointing input devices?
(A) I, II, and V only
(B) I, II, III, IV, and V
(C) I, III, IV, and V only
(D) II, III, and IV only

49. While MIPS (Millions of Instructions Per Second) evaluates general integer processing speed, which metric is specifically used to measure the performance of supercomputers in scientific calculations?
(A) FLOPS (Floating Point Operations Per Second)
(B) IOPS (Input/Output Operations Per Second)
(C) Baud rate
(D) IPC (Instructions Per Clock)

50. Which of the following interface ports is specifically designed to transmit both high-definition uncompressed video data and digital audio data through a single cable?
(A) VGA (Standard Analog Video Connection)

(A) Automatic washing machine
(B) Mechanical analog clock
(C) Wooden acoustic guitar
(D) Standard manual pump

72. When converting the decimal number 15 to the hexadecimal number system, which alphanumeric symbol is used?
(A) E
(B) F
(C) G
(D) A

73. The EBCDIC encoding system was primarily developed and utilized on mainframe computers manufactured by which technology company?
(A) Microsoft
(B) Apple
(C) Intel
(D) IBM

74. According to the truth table of a 2-input Exclusive-OR (XOR) gate, the output will be 1 (HIGH) when:
(A) Both signal inputs are currently low
(B) Both signal inputs are currently high
(C) The inputs have different logic levels
(D) The inputs have identical logic levels

75. A CPU optimization technique where multiple instructions are overlapped in execution, allowing a new instruction to start before the previous one has finished, is called:
(A) Spooling
(B) Buffering
(C) Paging
(D) Pipelining

76. Match the number systems in List I with their base or radix in List II:
List I: (Number Systems)
P. Binary
Q. Octal
R. Decimal
S. Hexadecimal
List II: (Base/Radix)
1. Base 10
2. Base 8
3. Base 16
4. Base 2
(A) P-4, Q-1, R-2, S-3
(B) P-2, Q-4, R-1, S-3
(C) P-1, Q-2, R-3, S-4
(D) P-4, Q-2, R-1, S-3

77. One Gigabyte (GB) of digital storage capacity is precisely equivalent to how many Megabytes (MB) in the standard binary (base-2) measurement system?
(A) 1000 MB
(B) 1024 MB
(C) 1048 MB
(D) 2048 MB

78. The 1's complement of the binary number 1011 is:
(A) 1010
(B) 0101
(C) 1100
(D) 0100

79. The IEEE 754 standard is the most widely adopted format in computing for representing which type of data?
(A) Alphanumeric text characters
(B) Floating-point numerical values
(C) Logical Boolean data values
(D) Digital audio signal streams

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80. In digital electronics, the basic sequential logic circuit capable of storing exactly one bit of data, whose state depends on previous inputs, is called a:
(A) Multiplexer
(B) Encoder
(C) Decoder
(D) Flip-flop

81. The core processing unit of most embedded systems, which integrates a CPU, memory (RAM and ROM), and programmable input/output peripherals on a single chip, is known as a:
(A) Microprocessor
(B) Co-processor
(C) Microcontroller
(D) Graphics Processing Unit

82. To efficiently convert a binary number to an octal number, the binary digits are grouped together starting from the rightmost bit. How many bits constitute one octal digit?
(A) 2 bits

(B) 3 bits
(C) 4 bits
(D) 8 bits

83. Match the logic gates in List I with their output conditions for 2-inputs in List II:
List I: (Logic Gates)
P. AND Gate
Q. OR Gate
R. XOR Gate
S. NOT Gate (Inverter)
List II: (Output Condition for 2-inputs)
1. Output is HIGH only if inputs are different
2. Output is the exact inverse of a single input
3. Output is HIGH if at least one input is HIGH
4. Output is HIGH only if both inputs are HIGH
(A) P-4, Q-1, R-3, S-2
(B) P-3, Q-4, R-1, S-2
(C) P-1, Q-3, R-4, S-2
(D) P-4, Q-3, R-1, S-2

84. Arrange the following digital memory storage units in ascending order of their capacity:
I. Terabyte (TB)
II. Kilobyte (KB)
III. Megabyte (MB)
IV. Gigabyte (GB)
(A) II, III, I, IV
(B) II, III, IV, I
(C) III, II, IV, I
(D) I, IV, III, II

85. Which modern character encoding standard is designed to represent letters and symbols from virtually all written languages of the world?
(A) BCD
(B) ASCII
(C) Unicode
(D) EBCDIC

86. What is the decimal equivalent of the binary number 1010?
(A) 8
(B) 10
(C) 12
(D) 14

87. Consider the following architectural classifications according to Flynn's taxonomy of parallel computing:
I. SISD (Single Instruction, Single Data)
II. SIMD (Single Instruction, Multiple Data)
III. MISD (Multiple Instruction, Single Data)
IV. MIMD (Multiple Instruction, Multiple Data)
V. DIMD (Dual Instruction, Multiple Data)
Which of the above statement(s) are valid classifications in Flynn's original taxonomy?
(A) I, II, III, and V only
(B) I, II, III, and IV only
(C) I, II, and IV only
(D) II, III, IV, and V only

88. In digital logic design, which of the following pairs are recognized as Universal Gates because any other logic gate can be constructed using only them?
(A) AND and OR
(B) NAND and NOR
(C) XOR and XNOR
(D) NOT and AND

89. In an 8-bit signed integer representation, if a mathematical operation results in a value greater than +127, the result incorrectly wraps around to a negative number. This computational error is known as:
(A) Underflow
(B) Overflow
(C) Quantization error
(D) Truncation

90. A combinational logic circuit known as a Half Adder adds two single-bit binary numbers. What are the two outputs generated by a Half Adder?
(A) Sum and Carry
(B) Sum and Difference
(C) Carry and Borrow
(D) Product and Remainder

91. An essential maintenance utility that rearranges fragmented data blocks on a mechanical hard drive so that files are stored in contiguous sectors, thereby improving read/write speed, is called:
(A) Storage Cleanup
(B) Disk Defragmenter
(C) Media Formatting
(D) System Recovery

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92. The National Supercomputing Mission (NSM) in India, aimed at building a grid of high-performance computing facilities, is jointly implemented by C-DAC and which other premier institution?
(A) Indian Institute of Technology, Indore (IIT-I)
(B) Raja Ramanna Centre for Advanced Technology (RRCAT)
(C) Indian Institute of Science, Bengaluru (IISc)
(D) Tata Institute of Fundamental Research (TIFR)

93. Developed in 1991 by the Centre for Development of Advanced Computing (C-DAC), which machine is widely recognized as India's first indigenous supercomputer?
(A) Pratyush
(B) Anupam
(C) SAGA-220
(D) PARAM 8000

94. The improper disposal of obsolete computer hardware results in serious environmental hazards due to the presence of toxic heavy metals such as lead, mercury, and cadmium. This specific category of waste is known as:
(A) Bio-medical waste
(B) Radioactive waste
(C) E-waste
(D) Municipal solid waste

95. The phenomenon in quantum computing where a qubit can exist in multiple states (both 0 and 1) simultaneously until it is measured is called:
(A) Quantum superposition
(B) Quantum tunnelling
(C) Quantum entanglement
(D) Quantum interference

96. Which of the following sequences represents the correct chronological order of the launch of Indian supercomputing systems from earliest to most recent?
I. PARAM 8000
II. PARAM Padma
III. Pratyush
IV. AIRAWAT
(A) II, I, IV, III
(B) I, II, III, IV
(C) III, I, II, IV
(D) I, IV, II, III

97. Which of the following describes a direct cause-and-effect relationship regarding computer hardware maintenance?
(A) Poor thermal paste causes CPU overheating
(B) Deleting cookies increases clock frequency
(C) BIOS upgrades reduce total drive capacity
(D) USB formatting improves GPU performance

98. When two qubits become linked such that the state of one instantly determines the state of the other regardless of the distance separating them, this quantum mechanic property is known as:
(A) Superposition
(B) Entanglement
(C) Decoherence
(D) Teleportation

99. While classical computers process data in bits (0s and 1s), quantum computers use a fundamental unit of information known as a:
(A) Quantum byte
(B) Quanta
(C) Q-word
(D) Qubit

100. A common ergonomic health condition characterized by pain and numbness in the hands and wrists, directly associated with prolonged and incorrect use of computer keyboards and mice, is:
(A) Cataract
(B) Tinnitus
(C) Spondylitis
(D) Carpal Tunnel Syndrome

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(B) Hyper-threading
(C) Overclocking
(D) Multiprocessing

60. Given below are two statements, one is labelled as Assertion (A) and the other as Reason (R).
Assertion (A): USB has largely replaced older serial and parallel ports on modern computers.
Reason (R): USB provides a standardized interface, supports high-speed data transfer, and allows for plug-and-play capability with hot-swapping.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

61. In basic binary arithmetic, what is the result of adding 1 + 1?
(A) 2
(B) 10
(C) 11
(D) 0 with no carry

62. In the context of binary data representation for signed integers, what does the Most Significant Bit (MSB) generally indicate?
(A) The sign of the number (positive or negative)
(B) The parity of the number
(C) The mathematical magnitude
(D) The fractional component

63. Which of the following is a valid numerical string in the binary number system?
(A) 1101001
(B) 1011201
(C) 10A01
(D) 102010

64. When transmitting data over very short internal computer distances, parallel transmission is faster than serial transmission because:
(A) Relies on wireless radio frequencies
(B) Compresses data via hardware algorithms
(C) Sends multiple bits over parallel wires
(D) Ignores all standard error-checking steps

65. A digital logic circuit that outputs a true (1) signal if and only if all of its input signals are true (1) represents the function of an:
(A) AND gate
(B) OR gate
(C) NOR gate
(D) XOR gate

66. A specialized computer system built into a larger mechanical or electrical device to perform dedicated, real-time functions is defined as an:
(A) Embedded system
(B) Artificial Intelligence cluster
(C) Enterprise server
(D) Analog processor

67. The hexadecimal number system, widely used in computing for simplified representation of binary data, uses a base or radix of:
(A) 8
(B) 10
(C) 16
(D) 32

68. The standard ASCII (American Standard Code for Information Interchange) encoding system originally used how many bits to represent a single character?
(A) 7 bits
(B) 8 bits
(C) 16 bits
(D) 32 bits

69. In computing terminology, a contiguous sequence of exactly four binary bits is formally called a:
(A) Nibble
(B) Byte
(C) Word
(D) Block

70. When performing binary subtraction, what is the result and borrow when calculating 0 - 1?
(A) Result 1, Borrow 0
(B) Result 0, Borrow 1
(C) Result 1, Borrow 1
(D) Result 0, Borrow 0

71. Which of the following consumer appliances is a classic example of a device controlled by an embedded computer system?

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purpose computers, allowing them to execute varied software applications.

9. (B) Performing mathematical calculations and logical comparisons
Inside every microprocessor, a dedicated logical unit handles all numerical computations and decision-making processes. It executes basic arithmetic operations such as addition and subtraction alongside complex logical evaluations like comparing two values. This unit is the primary engine for data transformation, converting raw input into meaningful results by following the specific rules defined by the instruction set.

10. (C) Server
In a networked computing environment, specialized high-capacity machines are designated to manage and distribute essential resources to other connected devices. These systems host files, provide database access, and manage security protocols for multiple users. By centralizing these services, they enable efficient collaboration and resource sharing across a local network or the wider internet for various organizational needs.

11. (D) EEPROM
Non-volatile memory technology has evolved to allow for the convenient modification of stored firmware without specialized equipment. Unlike earlier versions that required exposure to ultraviolet light, this specific type can be erased and reprogrammed using precise electrical signals. This capability makes it ideal for storing system configurations and BIOS updates that may need occasional changes during the hardware lifecycle.

12. (C) P-2, Q-4, R-1, S-3
Computer evolution is categorized into generations based on the primary electronic components used for switching. Early systems relied on vacuum tubes, followed by the adoption of transistors. Successive advancements introduced integrated circuits, eventually leading to modern very large-scale integration technology. Mapping these components to their respective eras illustrates the rapid progression in miniaturization and processing efficiency over decades.

13. (A) Von Neumann bottleneck
Modern computer performance is often restricted by the limited data transfer rate between the processor and the main memory. Because instructions and data share a single communication path, the CPU must frequently wait for information to arrive before it can continue processing. This structural limitation creates a significant delay, preventing the processor from operating at its maximum theoretical speed.

14. (C) Input Unit, Processing Unit, Output Unit
The fundamental logical structure of a computer system consists of three distinct functional stages. The first stage accepts data from the external environment, the second stage performs the necessary transformations and calculations, and the final stage presents the processed results to the user. This basic cycle of input, processing, and output defines the operation of all digital computers.

15. (D) Accumulator
Within the arithmetic logic unit, a primary register functions as the focal point for all computational tasks. It holds the initial operands and subsequently stores the intermediate results produced during mathematical or logical operations. By providing immediate access to these results, it minimizes the need to frequently access slower main memory, thereby significantly enhancing the overall speed of processing.

16. (A) Accuracy and reliability
The quality of the output generated by a computer is strictly dependent on the quality of the data it receives. If the initial information provided to the system is incorrect or flawed, the resulting output will inevitably be faulty. This principle emphasizes that while computers are highly accurate, they cannot correct errors present in the user's original data input.

17. (A) Internal CPU bus
High-speed communication within the central processing unit is facilitated by a specialized set of internal pathways. These connections allow for the rapid transfer of data and control signals between the arithmetic unit, the control unit, and various internal registers. This localized architecture is distinct from external paths,

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ensuring that internal operations are executed at the highest possible frequency.

18. (A) Workstation
Professional computing environments often require machines that offer more power than standard desktop computers but are intended for a single user. These systems are optimized for demanding tasks such as high-end 3D graphics, scientific simulations, and complex engineering design. They typically feature faster processors, expanded memory capacity, and professional-grade hardware components to handle intensive software applications efficiently.

19. (D) Multi-core processor
Modern semiconductor technology allows for the integration of several independent processing units within a single physical chip. Each unit can execute its own stream of instructions, enabling the computer to perform multiple tasks simultaneously or complete a single complex task much faster. This architectural design significantly improves overall system performance and efficiency compared to traditional single-unit processor designs.

20. (A) Peripheral devices
Hardware components that are connected externally to the main computer chassis to provide additional functionality are essential for user interaction. These include various tools for entering data, displaying information, and providing long-term storage. While they are not part of the core processing architecture, they are vital for expanding the computer's capabilities and allowing it to communicate with the user.

21. (C) I, II, and IV
Static random access memory utilizes flip-flop circuitry to maintain data, making it faster than dynamic alternatives. Conversely, dynamic memory requires constant refreshing to prevent data loss due to its capacitor-based design. While static memory is typically used for cache, the dynamic variety serves as the main system memory in modern personal computing environments because of its higher density.

22. (B) Fifth Generation
The current and future era of computing is defined by the development of systems that attempt to mimic human intelligence. These machines utilize advanced semiconductor technologies and parallel processing to handle complex tasks like natural language understanding and pattern recognition. This generation focuses on moving beyond simple calculations toward heuristic problem-solving and autonomous decision-making using sophisticated artificial intelligence.

23. (A) Both A and R are true and R is the correct explanation of A.
Medical equipment often functions as hybrid systems because they must bridge the gap between physical and digital data. These machines capture continuous physiological signals and transform them into discrete numerical values for analysis. This integration allows for real-time monitoring combined with precise digital processing, making such systems essential in modern healthcare for accurate diagnostic and imaging purposes.

24. (D) Control Unit
The internal management of a computer system is handled by a specialized component that acts like a supervisor. It interprets instructions from memory and sends timing and coordination signals to the arithmetic unit and other hardware. By managing the flow of data and ensuring every component acts at the correct moment, it maintains order within the complex processing environment.

25. (B) II, IV, I, III
Every instruction processed by a computer follows a standardized sequence of events known as the machine cycle. The process begins with retrieving the instruction from memory, followed by translating it into a format the hardware understands. Next, the specified operation is performed, and finally, the resulting data is saved back to memory or a register for later use.

26. (D) Ada Lovelace
Early history of computing recognizes a pioneering mathematician who envisioned the potential of machines to go beyond simple calculations. By creating a detailed sequence of operations for a proposed mechanical computer, this individual established the fundamental concepts of programming. This contribution proved that machines could follow complex algorithms to solve mathematical problems,

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laying the groundwork for modern software development.

27. (A) Registers, Cache Memory, Main Memory (RAM), Secondary Storage
Memory systems are organized in a hierarchy based on their proximity to the processor and their physical construction. Components located directly inside the CPU offer the fastest possible access, followed by specialized high-speed buffer memory. Primary system memory provides a larger workspace at moderate speeds, while long-term storage devices are the slowest but offer the greatest data capacity.

28. (A) It processes continuously varying physical quantities.
Certain computing systems are designed to operate on physical magnitudes rather than discrete numbers. These machines measure continuous changes in variables such as electrical voltage, hydraulic pressure, or mechanical movement to perform their tasks. They are particularly useful for simulating real-world physical systems where variables change smoothly over time, rather than in the stepped increments used by digital systems.

29. (C) Thermal throttling
To prevent permanent hardware damage from excessive heat, modern processors include built-in safety mechanisms. When internal temperatures reach a critical threshold, the system automatically lowers the operating frequency and voltage. This reduction in speed generates less heat, allowing the components to cool down while still maintaining basic functionality, though at a significantly lower level of performance.

30. (D) I, II, and III
System architecture focuses on attributes visible to programmers, such as instruction sets and data types. In contrast, organization involves hardware implementation details, including control signals and interface management, which remain transparent to the software layer. Understanding both concepts is vital, as the structural arrangement and logical design define the overall functional capabilities and performance of modern computer systems.

31. (C) Optical Mark Recognition (OMR)
Evaluating standardized tests requires a technology that can quickly detect the presence or absence of marks on a specific document. This system uses light sensors to identify darkened areas, such as filled-in circles or boxes, and converts this visual information into digital data. It is highly efficient for processing large volumes of exam sheets with minimal human error.

32. (B) Gigahertz (GHz)
The performance of a processor is often linked to its internal timing mechanism, which coordinates all operations. This speed is measured by the number of clock cycles completed every second. In modern computing, these cycles occur billions of times per second, necessitating a unit of measurement that reflects this massive scale of frequency for accurate performance comparison between systems.

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33. (B) Cache Miss
When the processor requires specific data, it first checks the fastest available internal memory. If the requested information is not present in this high-speed buffer, the system must retrieve it from the much slower main memory. This event causes a temporary delay in processing as the CPU waits for the data to be fetched from the more distant storage location.

34. (D) POST (Power-On Self-Test)
Every time a computer is energized, it must ensure that all vital hardware is ready for operation. This diagnostic routine checks the integrity of the processor, memory, and essential controllers before the operating system is allowed to load. If a critical component is missing or malfunctioning, the system will alert the user through specific error codes or audible signals.

35. (A) Plotter
Printing large-scale technical documents requires a specialized device that can produce precise, high-quality lines. Unlike standard printers that use dots to form images, these machines often use pens or advanced inkjet technology to draw continuous vector graphics. This makes them the ideal choice for creating detailed architectural blueprints, engineering maps, and other oversized professional diagrams with great accuracy.

36. (A) Switch Mode Power Supply (SMPS)
Internal computer components require stable, low-voltage electricity to function correctly, which is very different from the power provided by standard wall outlets. A specialized internal unit is responsible for converting high-voltage alternating current into the specific direct current voltages needed by the motherboard and drives. It also regulates this power to ensure a consistent and safe energy supply.

37. (A) Locality of reference
Computer systems exploit the tendency of programs to access the same data or instructions repeatedly within a short timeframe. By keeping recently used or nearby information in high-speed cache memory, the system reduces the time spent waiting for data from main memory. This principle is fundamental to modern architecture, significantly improving processing efficiency by predicting future data needs accurately.

38. (D) Maintains system time and BIOS settings
A small, dedicated power source on the motherboard ensures that critical system information is not lost when the computer is turned off. This energy keeps the internal clock running and preserves the low-level hardware configurations used by the system's firmware. Without this constant trickle of power, the computer would lose its date, time, and specific hardware setup every time.

39. (D) Width of the data bus
The speed at which information travels between the processor and other components is heavily influenced by the number of parallel paths available for data. A wider communication path allows more bits to be sent simultaneously in a single operation. This capacity is a key factor in determining the overall throughput and processing efficiency of the entire computer system architecture.

40. (D) Digitizer tablet
Creative professionals use specialized input surfaces to capture hand-drawn movements with high precision. These devices consist of a sensitive pad and a stylus that map physical strokes directly into digital coordinates on the screen. This technology allows for natural drawing and writing, making it an essential tool for digital artists, architects, and anyone requiring fine control over graphical input.

41. (B) Surge protector
Sensitive electronic hardware can be easily damaged by sudden, brief spikes in electrical voltage from the power grid. A dedicated protective device is used to detect these dangerous increases and divert the excess energy away from the connected equipment. This ensures that the delicate internal circuits of a computer remain safe during lightning strikes or other electrical disturbances.

42. (C) P-3, Q-2, R-4, S-1
Storage technologies are classified by the physical methods used to record data. Mechanical drives use magnetism on spinning platters, while discs use lasers to read physical pits and lands. Modern high-speed drives and portable sticks utilize semiconductor-based flash memory. Correctly matching these devices to their underlying technology highlights the diverse ways digital information is stored for long-term use.

43. (B) Form factor
Motherboards are manufactured according to standardized physical specifications to ensure compatibility with cases and power supplies. These standards define the dimensions of the board, the placement of mounting holes, and the arrangement of internal connectors. Following these universal designs allows users to mix and match components from different manufacturers, ensuring they fit together physically and electrically within a system.

44. (D) Universal Serial Bus
A widely adopted interface standard has simplified the process of connecting external devices to computers. This technology supports a vast range of peripherals, from simple keyboards to high-speed storage drives, through a common connector type. Its design allows for data transfer and power delivery simultaneously, while also supporting the ability to connect and disconnect devices without restarting the system.

45. (C) ROM or Flash Memory chip
The essential instructions required to start a computer are stored in a type of memory that does not lose its data when power is

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removed. This firmware is permanently or semi-permanently written into a specialized chip on the motherboard. It provides the initial code necessary to test hardware and locate the operating system, bridging the gap between hardware and software.

46. (C) L3 cache
Modern multi-core processors use a layered memory system to optimize performance. The largest and slowest level of this internal buffer is typically shared across all the different processing cores. By providing a common pool of high-speed data that is larger than the core-specific buffers, it helps coordinate tasks and reduces the frequency of slow accesses to the main system memory.

47. (B) Only the CPU generates target locations
In computer architecture, the pathway used for selecting memory locations only carries information in one direction. This is because the processor is the primary component responsible for specifying which address it needs to read from or write to. Since memory modules and input devices do not initiate these requests themselves, the communication path for addresses remains strictly from the CPU outward.

48. (B) I, II, III, IV, and V
Input devices that allow users to control the movement of a cursor or pointer on the screen are vital for navigating graphical interfaces. These tools use various technologies, including rolling balls, pressure-sensitive pads, and light-sensing pens, to translate physical movement into digital signals. Each of these devices serves the primary purpose of interacting with visual elements in a direct, spatial manner.

49. (A) FLOPS (Floating Point Operations Per Second)
While general computing speed is often measured by simple instruction counts, scientific research requires a different metric. Supercomputers are evaluated based on how many complex mathematical calculations involving fractional numbers they can perform in a single second. This measurement reflects the system's ability to handle massive simulations and data-intensive tasks common in fields like meteorology and physics.

50. (C) HDMI (High-Definition Multimedia Interface)
Modern audio-visual equipment relies on a standardized connection that can carry high-quality signals for both sound and picture. This single-cable solution simplifies setup by replacing multiple older cables with one digital interface. It supports uncompressed data, ensuring that the clarity of the video and the depth of the audio are maintained from the source device to the display screen.

51. (D) Uninterruptible Power Supply (UPS)
To prevent data loss and hardware damage during a sudden power failure, a specialized backup system is used. This device contains an internal battery that provides immediate electrical energy when the main power grid fails. This temporary power gives the user sufficient time to save their work and shut down the computer properly, protecting the integrity of the system.

52. (D) Low-intensity laser beams
Optical storage media store binary data as microscopic patterns on a reflective surface. To retrieve this information, a specialized drive shines a focused beam of light onto the disc. By measuring the way this light reflects off the various pits and flat areas, the system can distinguish between zeros and ones, converting the visual patterns back into digital data.

53. (C) P-4, Q-1, R-2, S-3
Different printing technologies utilize unique mechanisms to transfer content onto media. Some systems use physical impact against ribbons, while others spray liquid droplets or apply heat to sensitive paper. Advanced high-speed solutions employ laser beams and dry toner powder for precision. Identifying these mechanical differences is essential for selecting the appropriate device for specific professional tasks or home usage.

54. (C) III only
The communication infrastructure within a computer consists of specialized paths for data, addresses, and coordination signals. While the first two handle the actual information and its location, the third is responsible for timing and command signals between the CPU and other hardware. It does not directly manage the transfer

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74. (C) The inputs have different logic levels
A specific type of logical operation is designed to detect inequality between two input signals. It produces a high output only when the incoming signals are not the same, such as when one is high and the other is low. If both inputs are identical, the output remains low, making this gate extremely useful for comparison and arithmetic circuits.

75. (D) Pipelining
Processor efficiency can be significantly improved by breaking down instructions into smaller steps and processing them in an overlapping manner. This technique allows several instructions to be at different stages of execution simultaneously, much like an assembly line. As a result, the total number of instructions completed in a given time increases, even though each individual instruction takes time.

76. (D) P-4, Q-2, R-1, S-3
Number systems are defined by their unique base or radix, which indicates the number of distinct digits used. The binary system operates on two digits, while the octal and decimal systems use eight and ten respectively. Hexadecimal representation utilizes sixteen characters. These mathematical frameworks are fundamental for data representation, storage, and processing within various computer architectures and programming languages.

77. (B) 1024 MB
Digital storage capacity is calculated using powers of two, which leads to measurements that are slightly different from standard metric units. In this binary framework, each higher level of storage is exactly two to the power of ten times larger than the one below it. This results in a standard conversion factor that is used throughout the computing industry for memory.

78. (D) 0100
A fundamental operation in binary mathematics involves reversing the state of every bit in a sequence. By changing every zero to a one and every one to a zero, a new representation is created that is useful for various logical and arithmetic processes. This simple inversion is a key step in many digital signal processing and data manipulation tasks.

79. (B) Floating-point numerical values
Representing numbers with fractional parts in a digital format requires a complex standardized system. This universal framework defines how the sign, exponent, and significand are stored in memory to ensure consistency across different hardware platforms. It allows computers to handle extremely large or very small values with a predictable level of precision during scientific and financial calculations.

80. (D) Flip-flop
Digital circuits often need to remember a previous state to function correctly. A basic component exists that can hold a single bit of information indefinitely as long as power is supplied. Its output is determined by both current and past inputs, making it the fundamental building block for all types of electronic memory and sequential logic systems in computers.

81. (C) Microcontroller
Small-scale computing tasks are often handled by a single chip that contains all the necessary components of a full system. This includes the processor, memory, and specialized ports for interacting with external sensors and motors. These compact units are designed for cost-effective and energy-efficient control of specific devices, from toys to industrial sensors and automotive systems.

82. (B) 3 bits
Converting between binary and octal systems is simplified by the fact that the base of one is a perfect power of the base of the other. Because of this relationship, every single digit in the eight-base system can be represented by a fixed-length group of binary digits. This allows for quick and easy translation between the two formats.

83. (D) P-4, Q-3, R-1, S-2
Logic gates serve as the basic decision-making components in digital electronics, each following a specific rule for its output. Some require all inputs to be high, while others only need one. Specialized gates detect differences between signals or simply reverse the incoming state. Mapping these behaviors to their respective names is essential for understanding how complex circuits perform calculations.

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a single wire, this method transmits an entire group of bits at the exact same time across several adjacent wires. This approach significantly increases the amount of information that can be moved within short distances inside a computer system.

65. (A) AND gate
A fundamental building block of digital logic operates based on a strict requirement for all its inputs. It will only produce a high output signal if every single one of its incoming signals is also high. If any input is low, the output remains low. This behavior is essential for creating conditions where multiple criteria must be met simultaneously.

66. (A) Embedded system
Many modern appliances and industrial tools contain specialized computers that are integrated directly into the machine's hardware. Unlike general-purpose PCs, these systems are programmed to perform one specific set of tasks with high reliability. They manage the internal operations of everything from microwave ovens to automotive controllers, operating quietly in the background to ensure the device functions correctly.

67. (C) 16
Computing professionals often use a number system that provides a more compact way to represent long strings of binary data. This system uses sixteen distinct symbols, including the standard digits zero through nine and the first six letters of the alphabet. This base is particularly useful because it aligns perfectly with the four-bit structure of binary data groups.

68. (A) 7 bits
The early standard for character encoding was designed to represent English letters, numbers, and basic punctuation using a specific number of binary digits. This system allowed for a total of one hundred and twenty-eight unique characters. While later expanded for more versatility, the original foundation used this compact bit-length to ensure compatibility across different types of early computer hardware.

69. (A) Nibble
In the hierarchy of digital data measurement, a specific term is used to describe a cluster of exactly half a byte. This four-bit unit is significant because it corresponds to a single digit in the hexadecimal number system. Understanding these small groupings is helpful when analyzing low-level data structures and memory addressing within various types of computer processing units.

70. (C) Result 1, Borrow 1
Binary subtraction follows rules similar to decimal math when a smaller digit is subtracted from a larger one. When attempting to take one from zero, the system must take a value from the next higher position. This results in the current position having a value of one, while a signal is passed back to indicate that a borrow occurred.

71. (A) Automatic washing machine
Many household devices rely on dedicated internal processors to manage complex cycles and sensor inputs. These systems are programmed to handle specific functions, such as timing, water temperature, and motor speed, based on user selections. This integration of computing power into everyday machinery allows for advanced automation and efficiency without the need for a full general-purpose computer system.

72. (B) F
The hexadecimal system uses letters to represent values that exceed the single-digit capacity of the decimal system. In this framework, the value ten is represented by the first letter of the alphabet, and the sequence continues until the value fifteen is reached. This specific letter serves as the final single-character symbol before the system moves to a two-digit representation.

73. (D) IBM
A specialized character encoding system was developed specifically for use on large-scale corporate computers. This standard allowed for the representation of text and control characters in a way that was optimized for the hardware architecture of a major technology manufacturer. It remained the primary standard for these powerful systems for many decades, especially in large enterprise environments.

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of large files like the operating system during the boot process.

55. (A) Northbridge
In traditional motherboard designs, a critical controller manages the fastest communication paths in the system. It serves as the primary link between the processor, the high-speed system memory, and the graphics hardware. By handling these time-sensitive data transfers, it ensures that the most demanding components of the computer can communicate with minimal delay, maximizing the overall system performance.

56. (A) NAND flash memory chips
Modern persistent storage has moved away from mechanical parts toward electronic solutions. Instead of reading data from spinning magnetic disks, these newer drives use arrays of semiconductor chips to hold information. This lack of moving parts makes the drives much faster, more durable, and quieter than traditional hard disks, while still retaining all data even when the power is off.

57. (A) I, II, and III only
Modern firmware interfaces offer significant improvements over legacy systems, including support for extremely large storage volumes and advanced security features. These interfaces provide graphical environments for easier configuration and protective measures against unauthorized software during startup. While they enhance the initialization process, they serve as a bridge to the operating system rather than a complete replacement for it.

58. (A) Dots per inch (DPI)
The quality of a printed image is determined by the density of the tiny individual points of ink or toner placed on the page. A higher concentration of these points leads to greater detail and smoother gradients in the final output. This measurement is the standard way to describe the resolution and clarity of printers and scanners in professional settings.

59. (C) Overclocking
Users sometimes seek to gain more performance from their hardware by increasing its operational speed beyond the official factory limits. By adjusting the clock frequency, the component can process more instructions every second. However, this practice often requires increased voltage and generates more heat, potentially leading to system instability or hardware failure if not managed with proper cooling solutions.

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60. (A) Both A and R are true and R is the correct explanation of A.
The adoption of a universal interface has revolutionized how peripherals connect to computers, replacing a variety of older, slower ports. This standardized design offers significant advantages, including high-speed data transfer and the convenience of connecting devices while the system is running. These features have made it the dominant choice for almost all modern consumer and professional electronic accessories.

61. (B) 10
In the binary number system, which only uses the digits zero and one, mathematical operations follow specific rules. Adding two units together exceeds the capacity of a single digit, resulting in a zero in the current position and a carry to the next. This creates a two-digit result that represents the decimal value of two in a binary format.

62. (A) The sign of the number (positive or negative)
Digital systems use specific methods to represent both positive and negative integers using only binary digits. In these formats, the position with the highest mathematical value is often reserved to indicate whether the number is above or below zero. A zero in this position typically represents a positive value, while a one indicates that the number is negative.

63. (A) 1101001
The binary number system is characterized by its exclusive use of only two distinct symbols. Any valid representation within this system must consist entirely of zeros and ones. Sequences that include other digits or letters are not compatible with the binary framework, as it is based on a base-two mathematical structure used by all modern digital electronic circuits.

64. (C) Sends multiple bits over parallel wires
Data transfer efficiency can be improved by using multiple communication paths simultaneously. Instead of sending one bit after another over

84. (B) II, III, IV, I
Data storage units are organized in a clear progression of increasing size, with each step representing a much larger capacity. Starting from the smallest common unit used to describe files, the scale moves through levels used for documents, high-definition media, and finally, entire hard drives. Understanding this sequence is vital for managing storage space and comparing hardware specifications correctly.

85. (C) Unicode
To accommodate the global diversity of languages, a comprehensive character encoding standard was developed. It provides a unique number for every character, regardless of the platform, program, or language. This system supports tens of thousands of different symbols, including those from ancient scripts and modern emojis, ensuring that text can be exchanged and displayed accurately anywhere in the world.

86. (B) 10
Translating a binary sequence into a decimal value involves summing the values of the positions where a one is present. Each position in the binary system represents a power of two, starting from the right. By adding these specific values together, we can find the equivalent number used in our everyday decimal system for counting and calculation tasks.

87. (B) I, II, III, and IV only
Parallel computing architectures are formally classified based on the number of concurrent instruction and data streams they handle. This framework includes single and multiple combinations for both instructions and data, defining the theoretical foundation for various processor designs. These four distinct categories provide a standard methodology for describing the operational behavior of both classical and advanced high-performance computer systems.

88. (B) NAND and NOR
Certain logic gates are highly valued in digital design because they can be used to replicate the function of any other basic gate. By combining multiple instances of just one of these types, engineers can build any complex circuit required. This versatility simplifies the manufacturing process, as entire systems can be designed using only a single type of fundamental component.

89. (B) Overflow
Every digital storage location has a fixed capacity for the range of numbers it can represent. When a calculation produces a result that exceeds this maximum limit, the system cannot store the value correctly. This leads to an error where the number may wrap around to the opposite end of the range, resulting in highly inaccurate and unexpected outcomes.

90. (A) Sum and Carry
A basic circuit designed for binary addition processes two individual bits to produce two distinct outputs. One output represents the immediate result of the addition in the current position, while the other represents the value that must be passed to the next higher position. This simple structure forms the foundation for more complex arithmetic circuits used in processors.

91. (B) Disk Defragmenter
Mechanical hard drives often store parts of a single file in different physical locations, which slows down the process of reading data. A specialized maintenance tool is used to analyze the drive and move these pieces so they are stored next to each other. This reorganization allows the drive to read files more efficiently, improving overall system responsiveness.

92. (C) Indian Institute of Science, Bengaluru (IISc)
India's national initiative to enhance its high-performance computing capabilities is a collaborative effort involving premier technical organizations. This mission focuses on developing a network of supercomputers to support advanced research in various scientific fields. By combining the expertise of dedicated research centers and leading academic institutions, the project ensures the country remains at the forefront of global computational technology.

93. (D) PARAM 8000
The history of advanced computing in India began with the creation of a powerful parallel processing machine in the early nineties. Developed entirely within the country after access to foreign technology was restricted, it proved that domestic engineers could build

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world-class supercomputers. This achievement marked the beginning of a long-running series of high-performance systems used for diverse scientific and national applications.

94. (C) E-waste
The rapid turnover of technology leads to a significant environmental challenge as old computers and gadgets are discarded. These items contain hazardous materials that can leak into the environment if not handled properly. Specialized recycling processes are required to safely recover valuable metals while ensuring that toxic components do not cause harm to human health or the surrounding ecosystem.

95. (A) Quantum superposition
A fundamental principle of advanced physics allows subatomic particles to exist in multiple configurations simultaneously. In computing, this means a unit of information can represent several different values at the same time until it is specifically observed. This unique property enables certain types of computers to perform massive numbers of calculations at once, far exceeding the speed of traditional systems.

96. (B) I, II, III, IV
The development of high-performance computing in India has followed a significant historical path. Early indigenous achievements paved the way for more sophisticated systems designed for weather forecasting and scientific research. Recent advancements involve massively parallel architectures and artificial intelligence clusters. Tracking this timeline demonstrates the nation's growing expertise in building world-class supercomputing facilities for diverse and complex applications.

97. (A) Poor thermal paste causes CPU overheating
Effective heat management is critical for the stable operation of a central processing unit. A specialized material is used to fill microscopic gaps between the processor and its cooling system, ensuring efficient heat transfer. If this material degrades or is applied incorrectly, the processor cannot shed heat properly, leading to dangerously high temperatures and potential system failure or performance loss.

98. (B) Entanglement
In the world of quantum mechanics, two particles can be linked in such a way that their properties are perfectly synchronized. Any change to the state of one particle is immediately reflected in the other, even if they are separated by vast distances. This phenomenon is a cornerstone of future computing and communication technologies, enabling new ways to process information.

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99. (D) Qubit
Modern experimental computers use a different kind of information unit compared to the traditional zeros and ones of standard electronics. These units can represent a complex range of states, allowing for much more powerful calculations in certain specialized fields. This technology relies on the principles of quantum physics to solve problems that are currently impossible for even the fastest supercomputers.

100. (D) Carpal Tunnel Syndrome
Repetitive motions and poor posture during long periods of keyboard and mouse usage can lead to nerve compression in the wrist area. This ergonomic ailment results in pain, tingling, and numbness in the hands. Maintaining proper workstation setup and taking regular breaks are crucial preventative measures to avoid long-term physiological issues related to intensive and prolonged computer use.

CHAPTER 14

Software, Operating Systems and Applications

1. Which of the following statements best describes the need for an operating system in a computer?
(A) It functions solely to block malicious software and viruses from attacking hardware
(B) It acts as a database management tool for structuring user records and files
(C) It replaces the need for an arithmetic logic unit and control unit in the processor
(D) It acts as an intermediary between users and hardware, allocating resources efficiently

2. In device management, the concept of spooling (Simultaneous Peripheral Operations On-Line) is most commonly associated with which device?
(A) Monitor
(B) Keyboard
(C) Printer
(D) Mouse

3. Which of the following is considered a primary example of utility software?
(A) A web browser used to access the internet and view online web pages
(B) A word processor used to type, edit, and format text documents
(C) A disk defragmenter used to optimize file storage
(D) A presentation program used to create visual slides for meetings

4. The iOS operating system, exclusively developed for mobile devices like the iPhone and iPad, is created by which company?
(A) Google
(B) Microsoft
(C) Apple
(D) Samsung

5. A Real-Time Operating System (RTOS) is most critical for which of the following applications?
(A) Browsing multimedia websites and streaming high-definition video content online
(B) Controlling medical imaging and missile guidance systems
(C) Creating monthly financial spreadsheets and managing accounting ledger records
(D) Managing large-scale database queries and sorting massive datasets offline

6. The GNU General Public License (GPL) is a widely used free software license. Which of the following is its most defining feature?
(A) It allows users to modify the software but prohibits them from sharing the modifications
(B) It ensures that any derived works must also be distributed under the same open-source terms
(C) It requires users to pay a subscription fee to access the source code
(D) It delivers the software strictly to educational institutions

7. Which of the following provides the most accurate definition of computer software?
(A) A collection of integrated physical hardware components that process user inputs
(B) Instructions or programs used to operate computers and perform tasks
(C) A hardware component responsible for managing temporary memory and data processing
(D) A peripheral device used exclusively for secondary storage and long-term data retention

8. In the context of memory management techniques, what does the term 'Thrashing' signify?
(A) A high-speed data transfer between a USB

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(D) Incremental File Backup

46. Which of the following is a fundamental function of presentation software?
(A) Generating complex mathematical simulations and financial projections automatically
(B) Creating visual slides containing text, graphics, and multimedia
(C) Compiling high-level programming code into executable files for various systems
(D) Monitoring network traffic for security breaches and unauthorized data access

47. A flaw, error, or fault in a computer program that produces an incorrect or unexpected result is commonly referred to as a:
(A) Patch
(B) Bug
(C) Feature
(D) Protocol

48. The Software Development Life Cycle (SDLC) is a framework defining tasks performed at each step in the software development process. Which phase typically follows the 'Requirements Gathering and Analysis' phase?
(A) Deployment
(B) Design
(C) Testing
(D) Maintenance

49. Consider the following statements regarding Software Development Methodologies:
I. The Waterfall model allows easy changes to requirements at any stage of development.
II. Agile methodologies prioritize working software over comprehensive documentation.
III. In Scrum, the Product Owner is responsible for maximizing the value of the product.
IV. The Spiral model combines elements of both design and prototyping-in-stages to manage risk.
V. SDLC has no phase dedicated to software maintenance after deployment.
Which of the above statement(s) is/are correct?
(A) II, III and IV only
(B) I, II and V only
(C) I, III and IV only
(D) II, IV and V only

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50. In the context of cloud computing, what does SaaS stand for?
(A) System as a Service
(B) Storage as a Service
(C) Software as a Service
(D) Server as a Service

51. The Indian software industry is represented by a premier trade body and chamber of commerce of the Tech industry. What is its acronym?
(A) ASSOCHAM
(B) FICCI
(C) NITI Aayog
(D) NASSCOM

52. Which data compression technique reduces file size by permanently discarding some data, typically used for audio and video files?
(A) Lossless compression
(B) Archiving
(C) Encapsulation
(D) Lossy compression

53. Which of the following best describes the Agile methodology in software development?
(A) It relies on extensive, inflexible documentation and rigid planning before any coding
(B) It completely eliminates the testing phase to speed up the software delivery process
(C) An iterative approach that emphasizes flexibility and customer collaboration
(D) It requires all team members to work in isolation without any regular communication

54. Quality Assurance (QA) in the software development life cycle primarily focuses on:
(A) Fixing hardware malfunctions and physical circuit board failures in the motherboard
(B) Writing the actual source code for the application and designing the database schema
(C) Preventing defects by ensuring processes and standards are followed during development
(D) Marketing the software to potential clients and conducting advertising campaigns

55. In virtualization, what is the software layer that creates and runs virtual machines (VMs) called?
(A) Hypervisor

(C) It is a proprietary system built on the iOS kernel
(D) It uses a bare-metal architecture with no underlying kernel

18. Which of the following is NOT a primary objective of an operating system?
(A) Automatically generating application software code for users
(B) Using computer hardware in an efficient manner
(C) Executing user programs and making solving user problems easier
(D) Making the computer system convenient to use

19. Consider the following statements regarding device management and I/O handling:
I. Device drivers act as a bridge between the operating system and hardware devices.
II. Interrupts are signals sent to the CPU to request immediate attention for an I/O operation.
III. Direct Memory Access (DMA) slows down I/O operations by forcing the CPU to handle every data byte.
Which of the above statement(s) is/are incorrect?
(A) I only
(B) III only
(C) I and II only
(D) II and III only

20. The technique in memory management that allows a computer to compensate for physical memory shortages by temporarily transferring data from RAM to disk storage is known as:
(A) Virtual Memory
(B) Segmentation
(C) Paging
(D) Cache Memory

21. In the context of office productivity software, what is a "macro" typically used for in word processing or spreadsheet applications?
(A) To compress the document size significantly to save physical storage space on the disk
(B) To format the page margins and header styles for professional high-quality printing
(C) To automate repetitive tasks by recording a sequence of actions
(D) To protect the document with an encryption password and advanced security permissions

22. What is the primary function of an assembler in computer programming?
(A) To convert high-level language into machine code for execution on the processor
(B) To translate assembly language into machine language
(C) To execute object-oriented programming frameworks and manage software libraries
(D) To detect viruses in executable files and prevent unauthorized system access

23. Which operating system type processes jobs in a queue without user interaction once the jobs are submitted?
(A) Real-Time Operating System
(B) Time-Sharing Operating System
(C) Network Operating System
(D) Batch Operating System

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24. Who is credited with initiating the development of the Linux kernel, which serves as the core of the open-source Linux operating system?
(A) Richard Stallman
(B) Ken Thompson
(C) Dennis Ritchie
(D) Linus Torvalds

25. The hierarchical structure used by modern operating systems to organize files is known as the:
(A) Flat directory structure
(B) Tree-structured directory
(C) Two-level directory structure
(D) Acyclic-graph directory structure

26. In the context of programming languages, which generation is characterized by the use of machine independence and English-like statements such as C, C++, and Java?
(A) First Generation
(B) Second Generation
(C) Third Generation
(D) Fourth Generation

27. Which characteristic primarily distinguishes open-source software from proprietary software?
(A) Open-source software allows code modification, while proprietary software restricts access

(B) Open-source software is always free of cost for everyone, while proprietary is always paid
(C) Open-source software cannot be used for commercial purposes or by large corporate entities
(D) Proprietary software cannot be updated or patched once it has been installed on a machine

28. Consider the following statements regarding operating system environments:
I. A single-user multitasking operating system allows one user to run several programs at the same time.
II. A multi-user operating system requires a network and allows multiple users to access computer resources concurrently.
III. MS-DOS is an example of a multi-user, multi-tasking operating system.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II and III

29. Which version of the Windows Operating System introduced the 'Start Screen' with live tiles, removing the traditional Start Menu, before partially restoring it in subsequent updates?
(A) Windows 7
(B) Windows 8
(C) Windows 10
(D) Windows 11

30. What is the main objective of process management in an operating system?
(A) To allocate graphical processing units and video memory to application software
(B) To convert user files into various executable formats for different systems
(C) To physically clean the RAM disk sectors and reset the system's electrical charge
(D) To ensure processes are created, scheduled, and terminated efficiently

31. Which of the following is an example of a lossless file compression format widely used to compress multiple files into a single archive?
(A) JPEG
(B) MP3
(C) ZIP
(D) MP4

32. Firmware is a specific class of computer software that provides the low-level control for a device's specific hardware. Where is firmware typically stored?
(A) On a volatile RAM chip that requires constant power to maintain its stored data
(B) On a read-only memory (ROM) or flash memory chip
(C) In a temporary cloud storage bucket accessible only through an internet connection
(D) Within a web browser's cache folder stored on the user's primary desktop directory

33. Which of the following database tools uses a Relational Database Management System (RDBMS) architecture?
(A) Microsoft Word
(B) MySQL
(C) MongoDB
(D) Adobe Photoshop

34. What is the purpose of a software patch?
(A) To convert a proprietary software into open-source software by releasing code
(B) To translate source code into machine code using high-speed algorithms
(C) To partition the hard drive for a new operating system and file management
(D) To fix bugs, address security vulnerabilities, or improve performance

35. In the Scrum framework of Agile methodology, what is the term used for a short, time-boxed period where a specific work is completed and made ready for review?
(A) Sprint
(B) Marathon
(C) Milestone
(D) Standup

36. Accessibility software is designed to help differently abled users operate computers. Which of the following is a prime example of such software for visually impaired individuals?
(A) Screen reader software
(B) Speech-to-text dictation software
(C) High-resolution graphic editors

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(D) Disk defragmenters

37. Which feature in spreadsheet software allows users to quickly summarize, sort, and reorganize large datasets dynamically without altering the original data?
(A) Pivot Table
(B) Mail Merge
(C) Hyperlink
(D) Watermark

38. Which of the following is a classic example of a SaaS (Software as a Service) application?
(A) A physical DVD containing an operating system installation and bootable drivers
(B) A locally installed copy of an open-source Integrated Development Environment
(C) Microsoft Excel installed locally with no internet access or cloud features
(D) Google Workspace accessed via a web browser

39. In software testing, what is 'Black Box' testing?
(A) Testing the internal logic and source code structure directly by reviewing scripts
(B) Testing the hardware components exclusively to ensure compatibility with the system
(C) Testing the software only after it has crashed or encountered a critical system error
(D) Testing software's functionality without knowing its internal code structure

40. In the context of SDLC methodologies, which model is characterized by a linear and sequential approach where one phase must be completed before the next begins?
(A) Agile Model
(B) Scrum Model
(C) Spiral Model
(D) Waterfall Model

41. Consider the following statements regarding cloud-based software and virtualization:
I. SaaS applications require local installation and cannot be accessed via a web browser.
II. A Hypervisor allocates hardware resources such as CPU and RAM to virtual machines.
III. Virtualization allows multiple operating systems to run on a single physical host.
IV. Cloud computing relies on the internet to provide on-demand computing resources.
V. IaaS provides pre-built software applications directly to end-users.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) II, III and IV only
(C) III, IV and V only
(D) I, III and V only

42. What is the primary purpose of disk management tools in an operating system?
(A) To design user interfaces and graphical layouts for complex desktop applications
(B) To update the computer's BIOS firmware and manage internal hardware settings
(C) To manage partitions, format drives, and assign drive letters
(D) To detect and remove network intrusions and unauthorized firewall bypass attempts

43. What is a significant advantage of using virtual machines (VMs) on a single physical server?
(A) It increases the physical size of the server's hard drive and its electrical output
(B) It allows multiple operating systems to run concurrently, improving resource utilization
(C) It removes the need for any form of software licensing or rights management systems
(D) It eliminates the need for an underlying CPU and physical motherboard in the rack

44. An Application Programming Interface (API) is best defined as:
(A) A physical hardware connector linking two servers together within a data center
(B) A graphical user interface designed for visually impaired users to interact with hardware
(C) A compiler used exclusively for mobile application development and code translation
(D) Protocols and tools allowing different software applications to communicate

45. Which type of backup copies only the files that have changed since the last full backup, resulting in faster backup times but longer restoration times?
(A) Full System Backup
(B) Mirror Disk Backup
(C) Differential Backup

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Which of the following is a popular bug tracking tool?
(A) Microsoft Excel
(B) Adobe Premiere Pro
(C) Jira
(D) VLC Media Player

82. In an operating system, what does a "deadlock" refer to?
(A) A situation where processes cannot proceed because each is waiting for the other's resource
(B) A situation where the hard drive becomes completely full and prevents new data writing
(C) A critical system crash caused by a permanent hardware failure in the CPU
(D) An unrecoverable error during software installation that prevents launching

83. This question consists of two statements, Assertion (A) and Reason (R). To answer this question, choose the most appropriate option from the choices below.
Assertion (A): Open-source software is always exempt from copyright laws.
Reason (R): Open-source licenses, such as the GNU GPL, rely on copyright law to enforce terms like requiring modifications to remain open-source.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

84. In the context of accessibility software, what function does a screen magnifier perform?
(A) It translates spoken words into text and formats them for document creation
(B) It reads text out loud for visually impaired users using speech engines
(C) It enlarges a portion of the screen to assist users with low vision
(D) It replaces the mouse with a specialized trackball or eye-tracking peripheral

85. Which of the following represents the correct sequence of phases in a standard Software Development Life Cycle (SDLC)?
(A) Planning, Design, Implementation, Testing, Maintenance
(B) Design, Planning, Testing, Implementation, Maintenance
(C) Planning, Implementation, Design, Testing, Maintenance
(D) Implementation, Planning, Design, Maintenance, Testing
Choose the correct sequence.

86. DigiLocker is a flagship initiative of the Ministry of Electronics & IT (MeitY) under Digital India. What is its core function?
(A) To track public transport vehicles in real-time using GPS and satellite mapping
(B) To provide secure cloud-based storage for personal and official documents
(C) To act as a biometric attendance system for government employees across states
(D) To generate temporary internet IP addresses for areas without stable connections

87. Which mobile operating system utilizes a "sandbox" architecture natively to tightly restrict applications from accessing system files or other applications' data?
(A) MS-DOS
(B) iOS
(C) Symbian
(D) Windows 95

88. This question consists of two statements, Assertion (A) and Reason (R). To answer this question, choose the most appropriate option from the choices below.
Assertion (A): A compiler is generally faster in execution compared to an interpreter.
Reason (R): A compiler translates the entire source code into machine code in one go, generating an executable file that runs independently.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

89. Which operating system interface relies primarily on text commands typed by the user rather than graphical icons?

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(B) Emulator
(C) Assembler
(D) Firmware

56. How does heuristic analysis in antivirus software help protect a system?
(A) By identifying unknown viruses through behavioral analysis and pattern detection
(B) By isolating the computer from the physical network and all wireless connections
(C) By comparing file names with an online registry and verifying digital signatures
(D) By automatically compressing all downloaded files to scan for hidden scripts

57. A software update that addresses a security vulnerability on the exact same day the vulnerability is discovered or exploited is known as a:
(A) Zero-day patch
(B) Routine update
(C) Firmware downgrade
(D) BIOS reset

58. Consider the following statements regarding software licensing:
I. Freeware allows the user to use the software at no cost, but the source code is usually not available.
II. Open-source software requires users to pay a nominal fee for initial installation.
III. Public domain software has no copyright restrictions and can be modified freely.
IV. Shareware is a full-featured software offered free indefinitely.
Which of the above statement(s) is/are incorrect?
(A) I and III only
(B) II and IV only
(C) I, II and IV only
(D) II, III and IV only

59. Device drivers are essential for a computer system because they:
(A) Automatically update user application software to the most recent version online
(B) Increase the physical clock speed of the processor to enhance system performance
(C) They act as a translator between the operating system and hardware
(D) They provide an interface for creating databases and managing relational structures

60. Which of the following is the official app store for Android mobile operating systems?
(A) App Store
(B) Google Play
(C) Microsoft Store
(D) Galaxy Store

61. Which of the following components of an operating system acts as the core, managing system resources and communication between hardware and software?
(A) Shell
(B) Command Prompt
(C) Kernel
(D) Application Program Interface

62. Arrange the following Windows operating systems in the chronological order of their release:
I. Windows XP
II. Windows 10
III. Windows 7
IV. Windows 8
(A) I, III, IV, II
(B) I, IV, III, II
(C) III, I, IV, II
(D) IV, III, I, II

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63. What is the primary purpose of the UMANG app launched by the Government of India?
(A) A single unified platform for citizens to access multiple pan-India e-Gov services
(B) To provide a secure platform for cryptocurrency trading and asset management
(C) To act exclusively as a digital wallet for the UPI payment system and transactions
(D) To replace all state-level physical administrative offices with virtual centers

64. Multiprocessing in an operating system specifically refers to:
(A) Executing multiple processes on a single CPU by context switching
(B) Allowing multiple users to access a single program
(C) Executing processes using two or more physical CPUs simultaneously
(D) Partitioning a hard drive into multiple

flash drive and the internal hard drive
(B) A state where the system spends more time swapping pages than executing processes
(C) The process of permanently deleting files from the directory structure and bin
(D) An algorithm designed to prevent unauthorized memory access by external agents

9. Unix is best characterized as which type of operating system?
(A) Single-user, multi-tasking
(B) Multi-user, multi-tasking
(C) Single-user, single-tasking
(D) Real-time operating system

10. In which type of operating system do multiple users access the system simultaneously through terminals, with the processor's time shared among them?
(A) Batch Operating System
(B) Real-Time Operating System
(C) Time-Sharing Operating System
(D) Distributed Operating System

11. Consider the following statements regarding Linux and Unix operating systems:
I. Unix was originally developed at Bell Labs in the late 1960s.
II. Linux distributions usually include the GNU user-space tools.
III. Both Linux and Unix are entirely closed-source and proprietary.
IV. Ubuntu, Fedora, and Debian are popular Linux distributions.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) I, II and III only
(C) II, III and IV only
(D) I, III and IV only

12. What is the fundamental difference between a compiler and an interpreter?
(A) A compiler executes code line by line, while an interpreter translates the entire program into machine code at once for speed
(B) A compiler is used exclusively for assembly language conversion, while an interpreter is used only for high-level scripting
(C) A compiler translates entire source code before execution; an interpreter translates and executes line by line
(D) A compiler does not generate error reports during the process, while an interpreter detects all syntax errors before starting

13. Which Windows file system is known for supporting large file sizes, built-in encryption, and advanced access control lists (ACLs)?
(A) NTFS
(B) FAT32
(C) exFAT
(D) FAT16

14. Which process scheduling algorithm works by assigning a fixed time quantum to each process in a cyclic order?
(A) First-Come, First-Served (FCFS)
(B) Shortest Job First (SJF)
(C) Round Robin
(D) Priority Scheduling

15. Software that is distributed free of charge for a trial period, after which the user is requested to pay for continued use or extra features, is known as:
(A) Freeware
(B) Open-source software
(C) Public domain software
(D) Shareware

16. Which of the following best distinguishes system software from application software?
(A) System software manages hardware, while application software allows users to perform tasks
(B) System software performs user-specific tasks, whereas application software manages computer hardware
(C) System software is always open-source, whereas application software is always proprietary
(D) System software operates only on mobile devices, whereas application software operates only on desktops

17. Which of the following best describes the architecture of the Android mobile operating system?
(A) It is based on a modified version of the Linux kernel
(B) It is built entirely on the Windows NT kernel

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73. Which of the following represents the correct sequence of events when a computer boots up?
(A) BIOS execution, Power-On Self Test (POST), Bootloader execution, Operating System loads
(B) Power-On Self Test (POST), BIOS execution, Operating System loads, Bootloader execution
(C) Operating System loads, Power-On Self Test (POST), BIOS execution, Bootloader execution
(D) Bootloader execution, BIOS execution, Power-On Self Test (POST), Operating System loads

74. Match the software license type in List I with its characteristic in List II.
List I: (License Type)
P. Freeware
Q. Shareware
R. Proprietary
S. GNU GPL
List II: (Characteristic)
1. Free for a trial period, requires payment later
2. Source code is closed; user purchases a license to use
3. Free to use, but source code is typically not provided
4. Free to use, modify, and distribute; derived works must also be open
(A) P-3, Q-1, R-2, S-4
(B) P-1, Q-3, R-4, S-2
(C) P-3, Q-4, R-2, S-1
(D) P-2, Q-1, R-3, S-4

75. A firmware update process that gets interrupted and results in the hardware device becoming completely non-functional is commonly referred to in technical slang as:
(A) Bootstrapping
(B) Thrashing
(C) Spoofing
(D) Bricking

76. The Government of India developed the UMANG app. What does UMANG stand for?
(A) Universal Mechanism for Advanced National Governance
(B) Unique Mobile Application for Network Governance
(C) Utility Mechanism for New-age Government
(D) Unified Mobile Application for New-age Governance

77. Which of the following is NOT an example of Application Software?
(A) Microsoft Word
(B) Adobe Photoshop
(C) Mozilla Firefox
(D) Linux Kernel

78. Which utility software is specifically designed to detect and remove malicious software, such as Trojans, worms, and ransomware?
(A) Disk Cleanup Utility
(B) File Manager Tool
(C) Software Debugger
(D) Antivirus Software

79. Arrange the following programming languages in chronological order based on their typical generation classification (from 1st Generation to 4th Generation):
I. Assembly Language
II. SQL (Structured Query Language)
III. Machine Language
IV. C++ Language
(A) III, I, IV, II
(B) III, IV, I, II
(C) I, III, IV, II
(D) I, IV, II, III

80. Match the major Indian IT companies in List I with their founders or key figures in List II.
List I: (Company)
P. Infosys
Q. Wipro
R. HCL Technologies
S. Tata Consultancy Services
List II: (Key Figure)
1. Azim Premji
2. N.R. Narayana Murthy
3. F.C. Kohli
4. Shiv Nadar
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-4, Q-1, R-2, S-3

81. Software bugs are tracked and managed using specific software tools during development.

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logical drives

65. Match the utility software in List I with its function in List II.
List I: (Software)
P. Disk Defragmenter
Q. Backup Software
R. Antivirus
S. File Compressor
List II: (Function)
1. Reduces the size of files to save disk space
2. Scans for and removes malicious programs
3. Rearranges fragmented data to optimize disk speed
4. Creates duplicate copies of data for recovery
(A) P-3, Q-4, R-2, S-1
(B) P-4, Q-3, R-1, S-2
(C) P-3, Q-2, R-4, S-1
(D) P-1, Q-4, R-2, S-3

66. White Box testing in software engineering primarily involves:
(A) Testing with full knowledge of the internal code and program logic
(B) Testing software solely from an end-user's perspective without technical background
(C) Testing software by simulating network outages and extreme latency conditions
(D) Testing the aesthetic design and color schemes of the interface components

67. Which of the following major Indian IT services companies was founded in 1968 and is often regarded as a pioneer of the Indian software export industry?
(A) Infosys Limited
(B) Wipro Limited
(C) Tata Consultancy Services (TCS)
(D) HCL Technologies Limited

68. Match the application or initiative in List I with its primary function in List II.
List I: (Initiative)
P. UMANG
Q. DigiLocker
R. Android
S. NASSCOM
List II: (Function)
1. Mobile operating system developed by Google
2. Platform for accessing pan-India e-Gov services
3. Trade association of the Indian IT industry
4. Platform for issuance and verification of digital documents
(A) P-2, Q-4, R-1, S-3
(B) P-4, Q-2, R-1, S-3
(C) P-2, Q-1, R-4, S-3
(D) P-1, Q-4, R-2, S-3

69. What is a "Boot Sector Virus"?
(A) A virus that infects the master boot record of a hard drive
(B) A virus that encrypts user files and demands a ransom
(C) A virus that attaches itself to email attachments
(D) A virus that only infects word processing documents

70. Which of the following statements about cross-platform software is true?
(A) It is designed to run exclusively on one specific version of a proprietary system
(B) It cannot utilize graphical user interfaces and relies strictly on binary code
(C) It can operate on multiple operating systems such as Windows, macOS, and Linux
(D) It requires separate physical hardware components for each individual feature

71. Which of the following memory management techniques allocates memory into fixed-size blocks?
(A) Paging
(B) Segmentation
(C) Contiguous memory allocation
(D) Dynamic partitioning

72. Documents issued directly into a user's DigiLocker account by registered issuers are legally treated at par with original physical documents under which rule?
(A) The Right to Information Act, 2005 (including all subsequent amendments)
(B) The Information Technology (Digital Locker Facilities) Rules, 2016
(C) The Consumer Protection Act, 2019 (relating to digital commerce)
(D) The Telecom Regulatory Authority of India Act, 1997 (regarding protocols)

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(A) Graphical User Interface (GUI)
(B) Command Line Interface (CLI)
(C) Touch User Interface (TUI)
(D) Voice User Interface (VUI)

90. Match the Operating System in List I with its typical use case or nature in List II.
List I: (Operating System)
P. Real-Time OS
Q. Batch OS
R. Time-Sharing OS
S. Distributed OS
List II: (Nature/Use Case)
1. Handles payroll generation at the end of the month
2. Manages missile guidance systems
3. Combines resources of multiple independent computers over a network
4. Allows multiple users at different terminals to use the system simultaneously
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-2, Q-4, R-1, S-3
(D) P-4, Q-1, R-2, S-3

91. The term "REST API" is frequently used in modern software integration. What does REST stand for?
(A) Reliable External Storage Transmission
(B) Representational State Transfer
(C) Rapid Execution Software Testing
(D) Remote Encrypted System Terminal

92. A bug bounty program is an initiative implemented by tech companies to:
(A) Distributing software licenses at discounted rates for non-profit organizations
(B) Providing automatic software updates to premium users via encrypted channels
(C) Rewarding independent researchers for reporting software vulnerabilities
(D) Outsourcing their basic software development to freelancers in different zones

93. In database management tools, what does SQL stand for?
(A) Standard Query Language
(B) Sequential Query Language
(C) Server Query Language
(D) Structured Query Language

94. The Android mobile operating system primarily utilizes which programming language for its native application development?
(A) C#
(B) Swift
(C) Java / Kotlin
(D) Ruby

95. What is the primary purpose of a software "Compiler"?
(A) It converts high-level code into machine code
(B) It links multiple hardware devices together within a local network environment
(C) It monitors network connections for security breaches and unauthorized access
(D) It defragments physical storage drives to improve data retrieval speeds

96. Which of the following security software components is designed to monitor and control incoming and outgoing network traffic based on predetermined security rules?
(A) Keylogger
(B) Firewall
(C) Macro
(D) Disk defragmenter

97. Which of the following is considered an open-source database management tool?
(A) PostgreSQL
(B) Oracle Database
(C) Microsoft Access
(D) IBM Db2

98. Which government initiative serves as a digital document wallet to enable paperless governance and is integrated with Aadhaar for user authentication?
(A) BHIM
(B) DigiLocker
(C) e-NAM
(D) SWAYAM

99. Differential backup differs from incremental backup in that a differential backup:
(A) It copies only the files changed since the very first backup ever made during setup
(B) It copies only the files changed since the last incremental backup stored in the cloud
(C) It takes significantly longer to restore than a

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standard incremental backup sequence
(D) It copies all files changed since the last full backup

100. In an operating system, the mechanism that allows an application to explicitly request services from the operating system kernel is known as a:
(A) Paging interrupt
(B) Hypervisor trap
(C) Macro
(D) System Call

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ANSWERS

1. (D) It acts as an intermediary between users and hardware, allocating resources efficiently
An operating system serves as a crucial interface between computer hardware and the end user. It manages system resources, such as memory and processing power, ensuring that various applications run smoothly without direct hardware manipulation. This resource allocation provides a stable environment for executing software programs while abstracting complex hardware operations into manageable tasks for users and applications alike.

2. (C) Printer
Spooling stands for Simultaneous Peripheral Operations On-Line and is primarily used for managing data sent to printers. Since printers are much slower than processors, data is temporarily stored in a buffer or disk area. This allows the computer to continue other tasks while the printer retrieves and processes the stored documents at its own slower speed for efficient execution.

3. (C) A disk defragmenter used to optimize file storage
Utility software is designed to help analyze, configure, optimize, or maintain a computer system. A disk defragmenter is a classic example as it reorganizes fragmented data on a hard drive so files are stored in contiguous blocks. This process improves system performance and data access speeds by reducing the mechanical movement required to read files from the physical disk drive.

4. (C) Apple
The iOS mobile operating system is a proprietary platform developed and maintained exclusively by Apple Inc. for its hardware line, including the iPhone and iPad. It is characterized by a closed-source ecosystem that focuses on high security, seamless integration across devices, and a uniform user interface. This system is never officially licensed for use on any non-Apple hardware.

5. (B) Controlling medical imaging and missile guidance systems
A Real-Time Operating System is specifically engineered to process data and respond to inputs within extremely strict time constraints. Such systems are vital for critical applications where a delay of even milliseconds could lead to catastrophic failure. Examples include medical life-support equipment, industrial control systems, and missile guidance platforms that require deterministic and predictable responses to various external events.

6. (B) It ensures that any derived works must also be distributed under the same open-source terms
The GNU General Public License is a copyleft license that guarantees end users the freedom to run, study, share, and modify software. Its most defining characteristic is the requirement that any derivative work created from GPL-licensed code must also be released under the same license terms. This ensures the software remains free and open for all future users.

7. (B) Instructions or programs used to operate computers and perform tasks
Computer software consists of a comprehensive set of instructions, data, or programs used to operate computers and execute specific tasks. It acts as the intangible component of a computer system, contrasting with the physical hardware. Software is responsible for telling the hardware exactly what to do and how to process information to provide meaningful results for the end user.

8. (B) A state where the system spends more time swapping pages than executing processes
Thrashing occurs in a virtual memory system when a computer's physical memory is overcommitted, causing the operating system to constantly swap data between the RAM and the hard disk. In this state, the system spends significantly more time on paging operations than on actually executing application code. This leads to a massive drop in overall system performance and responsiveness.

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64. (C) Executing processes using two or more physical CPUs simultaneously
Multiprocessing is the capability of an operating system to support the simultaneous execution of multiple processes by using two or more physical central processing units. This allows the system to divide tasks among the available processors, significantly increasing the overall computational speed and efficiency. It is commonly used in high-performance servers that require intensive processing power for complex tasks.

65. (A) P-3, Q-4, R-2, S-1
Utility software performs specific maintenance tasks to keep a computer running efficiently. Disk defragmenters rearrange scattered data to speed up disk access, while backup software creates copies of files for data recovery. Antivirus programs protect the system by scanning for malware. File compressors reduce the size of files, which helps save storage space and makes data transfer easier.

66. (A) Testing with full knowledge of the internal code and program logic
White Box testing is a software testing strategy that involves examining the internal logic and code structure of an application. Testers have full access to the source code, allowing them to verify the flow of inputs and outputs through the program. This type of testing is used to identify hidden errors, optimize performance, and ensure all operations function correctly.

67. (C) Tata Consultancy Services (TCS)
Tata Consultancy Services is a global leader in IT services and was a pioneer in the Indian software export industry. Founded in 1968, it became the first Indian company to enter the international market for software services. Its early success laid the groundwork for India's reputation as a major global hub for information technology and software services.

68. (A) P-2, Q-4, R-1, S-3
Various digital initiatives serve distinct roles. UMANG provides a single interface for diverse government services, while DigiLocker allows for the secure storage and verification of digital documents. Android is a major mobile operating system developed by Google. NASSCOM functions as the primary trade association representing the interests of the Indian IT industry, promoting growth and setting industry standards.

69. (A) A virus that infects the master boot record of a hard drive
A boot sector virus is a type of malware that targets the master boot record or the boot sector of a computer's hard drive. These areas contain the essential code required to start the computer and load the operating system. By infecting this critical location, the virus can execute its malicious code every time the system is powered on.

70. (C) It can operate on multiple operating systems such as Windows, macOS, and Linux
Cross-platform software is designed to function seamlessly across different operating systems, such as Windows, macOS, and Linux. This capability allows developers to reach a wider audience without rewriting the entire application for each specific platform. Such software often relies on standardized programming languages or specialized frameworks that abstract the differences between operating systems, ensuring consistent behavior for all users.

71. (A) Paging
Paging is a memory management scheme that eliminates the need for contiguous allocation of physical memory. It works by dividing physical memory into fixed-size blocks called frames and dividing logical memory into blocks of the same size called pages. This method prevents external fragmentation and allows the operating system to allocate non-contiguous memory to processes, making efficient use of RAM.

72. (B) The Information Technology (Digital Locker Facilities) Rules, 2016
Under the Information Technology (Digital Locker Facilities) Rules, 2016, documents issued to a user's DigiLocker account by authorized organizations are legally recognized as equivalent to original physical documents. This rule is a key component of India's Digital India initiative, providing citizens with a secure, paperless way to manage and share official credentials, such as driving licenses and certificates.

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18. (A) Automatically generating application software code for users
An operating system focuses on managing hardware resources efficiently and providing a convenient environment for users to execute their programs. It handles complex tasks like memory allocation, file management, and processor scheduling. However, it does not possess the capability to automatically generate application software code for users, as software development remains a creative task performed by human programmers or specialized tools.

19. (B) III only
Direct Memory Access is a feature that significantly improves system performance by allowing hardware subsystems to access main system memory independently of the central processing unit. Instead of forcing the CPU to handle every individual byte of data, DMA transfers large blocks of data directly, which frees the processor to perform other computational tasks, speeding up I/O.

20. (A) Virtual Memory
Virtual memory is a sophisticated memory management technique that enables a computer to use a portion of the hard drive as if it were additional RAM. This allows the system to run larger applications or more programs simultaneously than the physical memory would normally permit. It works by swapping data between the physical RAM and a dedicated swap file.

21. (C) To automate repetitive tasks by recording a sequence of actions
A macro is a recorded sequence of commands or instructions that can be triggered by a single action, such as a keyboard shortcut. In productivity software like spreadsheets or word processors, macros are used to automate repetitive or complex tasks. This significantly increases efficiency by allowing users to perform multi-step operations instantly without manually executing every individual step each time.

22. (B) To translate assembly language into machine language
An assembler is a specialized translation program that converts code written in assembly language into machine language. Assembly language uses mnemonic codes that are easier for humans to understand than pure binary. The assembler translates these mnemonics into the specific bit patterns that the computer's processor can execute directly, allowing low-level programming while providing a more readable format.

23. (D) Batch Operating System
A batch operating system processes groups of similar jobs without direct user interaction. Users submit their tasks to an operator who organizes them into batches based on similar requirements. Once the processing begins, the system executes each job in the queue sequentially. This model was highly prevalent in early mainframe environments where maximizing the throughput of expensive hardware was essential.

24. (D) Linus Torvalds
Linus Torvalds is the computer scientist who initiated the development of the Linux kernel in 1991. Initially created as a personal project, the kernel became the foundation for the open-source Linux operating system. His work revolutionized the software industry by promoting a collaborative development model where thousands of programmers worldwide contribute to the code, ensuring transparency and constant innovation.

25. (B) Tree-structured directory
Modern operating systems organize files using a tree-structured directory system. In this hierarchical model, there is a root directory that contains files and subdirectories, which can in turn contain more files and folders. This structure allows users to logically categorize their data into branches, making it easier to locate, manage, and secure information within a complex storage environment.

26. (C) Third Generation
Third-generation programming languages represent a significant advancement by introducing machine independence and using English-like syntax. Languages such as C, C++, and Java allow developers to write code that is much easier to read and maintain compared to low-level assembly. These languages require a compiler or interpreter to translate the source code into a format for execution.

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faster than a full backup, the time required for restoration is longer because both the original full backup and the latest differential backup must be processed together.

46. (B) Creating visual slides containing text, graphics, and multimedia
Presentation software is designed to help users create visual aids for speeches or meetings. Its fundamental function is to allow the creation of slides that incorporate text, graphics, images, and multimedia elements like audio or video. These tools provide templates and transition effects to make the information more engaging and easier for the audience to understand during lectures.

47. (B) Bug
A bug is a flaw, error, or failure in a computer program that causes it to produce incorrect or unintended results. Bugs can arise from mistakes in the source code, design flaws, or unexpected interactions between different software components. Identifying and fixing these issues is a central part of the software development and testing process for reliability.

48. (B) Design
In the Software Development Life Cycle, the Design phase immediately follows the 'Requirements Gathering and Analysis' stage. During this phase, the detailed requirements are transformed into a technical blueprint. This includes defining the software architecture, database structures, user interfaces, and system interfaces. This design serves as the primary guide for programmers when they begin implementation.

49. (A) II, III and IV only
Agile methodologies focus on delivering working software through iterative development, prioritizing flexibility over rigid documentation. Within the Scrum framework, the Product Owner ensures the team delivers maximum value. The Spiral model is an advanced approach that incorporates risk analysis and prototyping at multiple stages. These modern methodologies are designed to handle complex projects and evolving requirements effectively.

50. (C) Software as a Service
SaaS stands for Software as a Service, which is a popular cloud computing model. In this model, the software application is hosted centrally by a service provider and is made available to customers over the internet. Users typically pay a subscription fee to access the software through a web browser, eliminating the need for local installation and maintenance.

51. (D) NASSCOM
NASSCOM, which stands for the National Association of Software and Service Companies, is the premier trade body and chamber of commerce for the Indian tech industry. It plays a critical role in policy advocacy, networking, and setting industry standards. By representing the interests of the software and IT services sector, NASSCOM helps drive global technology innovation.

52. (D) Lossy compression
Lossy compression is a data reduction technique that permanently discards less critical information to achieve a significantly smaller file size. This method is commonly applied to audio, video, and image files where a minor loss in quality is acceptable and often imperceptible to the human eye. Once data is removed during lossy compression, it cannot be perfectly restored.

53. (C) An iterative approach that emphasizes flexibility and customer collaboration
Agile methodology is an iterative and incremental approach to software development that emphasizes flexibility and continuous feedback. It focuses on delivering small, functional pieces of software in short cycles, allowing teams to respond quickly to changing requirements. Strong collaboration between developers and customers is a core principle, ensuring that the final product closely aligns with user needs.

54. (C) Preventing defects by ensuring processes and standards are followed during development
Quality Assurance is a proactive process in the software development life cycle that focuses on preventing defects before they occur. It involves establishing and following standardized procedures and best practices throughout the development stages. By ensuring that the correct processes are used, QA aims to improve software

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are blind or have significant visual impairments. It functions by converting the text and graphical elements displayed on a computer screen into synthesized speech or Braille output. This allows users to navigate the operating system, browse the internet, and use various applications independently by listening to descriptions.

37. (A) Pivot Table
A Pivot Table is a powerful data analysis tool found in spreadsheet programs like Excel. It allows users to quickly summarize and reorganize large volumes of data without modifying the source information. Users can dynamically drag and drop different fields to see the data from various perspectives, such as calculating totals, averages, or counts, making it indispensable for reports.

38. (D) Google Workspace accessed via a web browser
Software as a Service is a cloud-based delivery model where applications are hosted by a provider and accessed by users over the internet. Google Workspace is a classic example, as its tools like Docs and Sheets are accessed through a web browser rather than being installed locally. This model offers the benefits of automatic updates and cloud-based collaboration.

39. (D) Testing software's functionality without knowing its internal code structure
Black Box testing is a software testing methodology where the internal structure, design, and implementation of the program are not known to the tester. The focus is entirely on the software's functional requirements. Testers provide various inputs and verify if the resulting outputs match the expected behavior. This approach ensures that the application meets user needs and requirements.

40. (D) Waterfall Model
The Waterfall model is a classic Software Development Life Cycle approach characterized by its linear and sequential structure. In this model, development progresses steadily through various phases such as requirements, design, implementation, and testing. Each phase must be fully completed and reviewed before the next one can begin. This rigid structure makes it easy to manage projects.

41. (B) II, III and IV only
Virtualization is a technology that allows multiple operating systems to run on a single physical host by using a hypervisor to manage hardware resources. Cloud computing leverages the internet to deliver these resources on demand. While Software as a Service applications are accessed via browsers, Infrastructure as a Service provides virtualized computing resources like servers and storage.

42. (C) To manage partitions, format drives, and assign drive letters
Disk management tools are essential utilities within an operating system used to handle physical and logical storage drives. These tools allow users to create and delete partitions, format drives with specific file systems, and assign drive letters for easy identification. By managing how data is structured on the disk, these utilities ensure storage space is utilized effectively.

43. (B) It allows multiple operating systems to run concurrently, improving resource utilization
A significant advantage of using virtual machines on a single physical server is the ability to run multiple independent operating systems concurrently. This improves hardware resource utilization because several virtual servers can share the same physical CPU, RAM, and storage. It also provides isolation between environments, making it easier to test software and recover from system failures.

44. (D) Protocols and tools allowing different software applications to communicate
An Application Programming Interface is a set of defined rules, protocols, and tools that allow different software applications to communicate with each other. It specifies how software components should interact, enabling one program to request data or services from another. APIs are fundamental to modern software development, allowing developers to integrate third-party services like maps into their applications.

45. (C) Differential Backup
A differential backup is a data preservation strategy that copies only the files that have been created or modified since the last full backup. While this makes the daily backup process

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27. (A) Open-source software allows code modification, while proprietary software restricts access
The primary distinction between open-source and proprietary software lies in the accessibility of the source code. Open-source software provides users with the legal right to view, modify, and redistribute the underlying code. Proprietary software, however, is closed-source and owned by a specific entity. Users are granted a license to use the program but cannot modify its internals.

28. (A) I and II only
Single-user multitasking systems allow an individual to run several applications at once, while multi-user systems enable multiple people to share the same computer resources through a network. MS-DOS, however, is a classic example of a single-user, single-tasking operating system, meaning it could only handle one user and one process at a time, unlike modern systems.

29. (B) Windows 8
Windows 8 was a major release of the Microsoft operating system that introduced the radical 'Metro' design language. It replaced the traditional Start Menu with a full-screen 'Start Screen' featuring live tiles. This change was designed to create a unified experience across touchscreens and traditional computers. However, due to user feedback, the traditional Start Menu functionality was partially restored.

30. (D) To ensure processes are created, scheduled, and terminated efficiently
Process management is a core function of an operating system responsible for handling the lifecycle of all running programs. The primary objective is to ensure that processes are created, assigned processor time through scheduling, and terminated efficiently once their tasks are complete. This management prevents conflicts between applications, ensures fair resource distribution, and maintains the overall stability of the computer.

31. (C) ZIP
The ZIP format is a widely used example of lossless file compression. Lossless compression allows the original data to be perfectly reconstructed from the compressed file without any loss of information. This is essential for documents, executable files, and archives where every bit of data must remain intact. ZIP files also allow multiple files to be bundled together.

32. (B) On a read-only memory (ROM) or flash memory chip
Firmware is a specific type of low-level software embedded directly into a hardware device's non-volatile memory. It is typically stored on Read-Only Memory or flash memory chips. Unlike software stored on a hard drive, firmware remains on the device even when power is lost. It provides the essential instructions for the hardware to communicate with other computer components.

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33. (B) MySQL
MySQL is a prominent example of a Relational Database Management System. It uses a structured architecture where data is organized into tables consisting of rows and columns. These tables are linked through defined relationships, allowing for complex queries and efficient data retrieval using Structured Query Language. This RDBMS approach is widely utilized for web applications and enterprise systems.

34. (D) To fix bugs, address security vulnerabilities, or improve performance
A software patch is a small update designed to fix specific problems within a program or to provide minor enhancements. Patches are critical for addressing newly discovered security vulnerabilities, fixing software bugs that cause crashes, and optimizing overall performance. Regularly applying patches ensures that applications remain secure and functional, protecting users from potential exploits and improving software reliability.

35. (A) Sprint
In the Scrum framework of Agile methodology, a Sprint is a consistent, time-boxed interval, usually lasting two to four weeks. During this period, the development team works to complete a specific set of tasks from the product backlog. The goal of every Sprint is to produce a functional, potentially releasable product increment that can be reviewed by stakeholders.

36. (A) Screen reader software
Screen reader software is an essential accessibility tool designed for individuals who

quality and reliability, ultimately delivering a product that meets specified requirements.

55. (A) Hypervisor
A hypervisor is a crucial software layer that enables virtualization by creating and managing virtual machines. It sits between the physical hardware and the guest operating systems, allocating resources like CPU, memory, and storage to each VM. This allows multiple, isolated operating systems to run simultaneously on a single physical machine, maximizing hardware efficiency and providing flexible environments.

56. (A) By identifying unknown viruses through behavioral analysis and pattern detection
Heuristic analysis is an advanced security technique used by antivirus software to detect previously unknown viruses or new variants of existing malware. Unlike traditional signature-based detection, which looks for specific code fragments, heuristic analysis monitors the behavior and suspicious patterns of a program. This proactive approach helps protect systems against "zero-day" threats by identifying files with malicious characteristics.

57. (A) Zero-day patch
A zero-day patch is a critical software update released to fix a security vulnerability on the same day it becomes known to the developers or is exploited by attackers. These vulnerabilities are called "zero-day" because the software creator has had zero days to prepare a fix. Applying these patches immediately is vital for protecting systems from hackers.

58. (B) II and IV only
Open-source software is generally characterized by the freedom to access and modify source code, often without initial installation fees. Shareware, conversely, is not offered free indefinitely; it is typically provided for a limited trial period to allow users to evaluate the program. After this period, users must purchase a license to continue using the software legally.

59. (C) They act as a translator between the operating system and hardware
Device drivers are specialized software components that enable the operating system to communicate effectively with various hardware devices. They act as a translator, converting the general input/output commands of the OS into specific signals that the hardware can understand. Without the correct drivers, the operating system would be unable to control or use peripherals like printers and adapters.

60. (B) Google Play
Google Play is the official digital distribution platform and app store for the Android operating system. Managed by Google, it allows users to browse, download, and update a vast array of applications, games, and media. The platform also provides security features by scanning apps for malware before they are installed on a user's device, ensuring a safer environment.

61. (C) Kernel
The kernel is the central and most fundamental component of an operating system. It acts as a bridge between applications and the actual data processing performed at the hardware level. The kernel is responsible for managing system resources such as the CPU, memory, and device drivers, ensuring that software can interact with hardware components securely while maintaining stability.

62. (A) I, III, IV, II
The release of Microsoft Windows versions followed a specific chronological path starting with Windows XP in 2001. This was followed by Windows 7 in 2009, which significantly improved the user interface. Windows 8 was released in 2012, introducing a tile-based design. Finally, Windows 10 was launched in 2015, unifying the platform across various devices including desktops and tablets.

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63. (A) A single unified platform for citizens to access multiple pan-India e-Gov services
The UMANG app, which stands for Unified Mobile Application for New-age Governance, was launched by the Government of India to provide citizens with a single platform to access various pan-India e-Government services. It integrates numerous services from central and state government departments, such as Aadhaar and PAN. This unified approach simplifies the way citizens interact with the government.

9. (B) Multi-user, multi-tasking
Unix is a powerful and versatile operating system designed to support multiple users simultaneously while running various tasks at once. Developed originally in the late 1960s, its architecture emphasizes modularity and stability. These features allow it to efficiently manage complex server environments and workstations where concurrent access to resources and high-level processing capabilities are essential for productivity.

10. (C) Time-Sharing Operating System
A time-sharing operating system allows multiple users to access a central computer system concurrently through various terminals. The system allocates small slices of CPU time to each user in rapid succession. This rapid switching creates the illusion that each user has the processor's full attention, enabling efficient use of computing resources in a multi-user environment for general tasks.

11. (A) I, II and IV only
Unix development began at Bell Labs, establishing a foundation for modern computing. Linux, while inspired by Unix, is an open-source kernel typically bundled with GNU tools to create complete distributions like Ubuntu and Fedora. Unlike Unix, which often has proprietary versions, Linux remains open-source. These systems are widely used in servers and development environments due to their stability.

12. (C) A compiler translates entire source code before execution; an interpreter translates and executes line by line
Compilers and interpreters differ primarily in how they process source code. A compiler scans the entire program and translates it into a standalone executable machine code file before any execution occurs. In contrast, an interpreter processes the code line by line, translating and executing each instruction immediately. Compilers generally produce faster execution times while interpreters offer easier debugging during development.

13. (A) NTFS
The New Technology File System is the standard file system used by modern Windows operating systems. It offers significant improvements over older systems by supporting extremely large file sizes and volumes. Additionally, it provides advanced features such as file-level encryption, compression, and Access Control Lists, which allow administrators to set specific permissions for different users, enhancing security.

14. (C) Round Robin
Round Robin is a preemptive process scheduling algorithm designed specifically for time-sharing systems. Each process in the ready queue is assigned a small, fixed unit of time called a time quantum. The CPU cycles through these processes, giving each one a turn. If a process does not finish within its quantum, it is moved to the back of the queue.

15. (D) Shareware
Shareware is a type of software distribution that allows users to try a program for a limited time or with restricted features before making a purchase. The primary goal is to provide a trial period so users can evaluate the software's utility. Once the period ends, users are typically required to pay a fee to continue using the full version.

16. (A) System software manages hardware, while application software allows users to perform tasks
System software consists of programs like operating systems and device drivers that manage the computer's internal hardware and provide a platform for other software to run. Application software, however, is designed for the end user to perform specific tasks such as writing documents, editing photos, or browsing the web. System software runs in the background while applications interact directly.

17. (A) It is based on a modified version of the Linux kernel
The Android operating system is built upon a modified version of the Linux kernel, which provides essential system services such as memory management, process management, and hardware abstraction. This open-source foundation allows developers to create a highly customizable platform for mobile devices. The kernel acts as a secure layer between the hardware components and the high-level software applications.

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73. (A) BIOS execution, Power-On Self Test (POST), Bootloader execution, Operating System loads
When a computer is powered on, it follows a specific sequence called the boot process. First, the BIOS or UEFI firmware initializes. Next, it performs a Power-On Self Test to verify that hardware components are functioning correctly. Then, the system locates and executes the bootloader, which is a small program responsible for loading the operating system into memory.

74. (A) P-3, Q-1, R-2, S-4
Software licenses define how programs can be used and distributed. Freeware is free to use but typically closed-source, while shareware requires payment after a trial period. Proprietary software is owned by a company and requires a purchased license. The GNU GPL allows users to modify and share software, provided any derived works also remain open-source for future users.

75. (D) Bricking
In technical terms, "bricking" refers to a situation where a hardware device becomes completely non-functional due to a severe software or firmware error. This often occurs when a firmware update process is interrupted by a power failure or a critical system crash. A "bricked" device will no longer boot or respond to commands, effectively becoming as useless as a brick.

76. (D) Unified Mobile Application for New-age Governance
UMANG stands for Unified Mobile Application for New-age Governance. It is a flagship initiative by the Government of India designed to provide citizens with a single point of access to a wide range of government services. By consolidating services from various departments into one mobile application, it aims to promote digital empowerment by making public services more easily accessible.

77. (D) Linux Kernel
Application software includes programs that perform specific tasks for users, such as writing documents with Microsoft Word or editing images with Adobe Photoshop. Browsers like Mozilla Firefox also fall into this category. In contrast, the Linux Kernel is a core part of system software. It manages the computer's hardware and provides the platform for application software to run effectively.

78. (D) Antivirus Software
Antivirus software is a dedicated utility designed to protect computer systems from various types of malicious software. It works by scanning files and system memory for known patterns associated with viruses, Trojans, worms, and ransomware. Once detected, the antivirus can quarantine or remove the threats to prevent data loss, unauthorized access, and damage to the operating system and applications.

79. (A) III, I, IV, II
Programming languages evolved through several generations, starting with machine language as the first generation. This was followed by assembly language as the second generation, which used mnemonic codes. Third-generation languages, such as C++, introduced higher-level, more readable syntax. Finally, fourth-generation languages like SQL were developed to be even more specialized for specific tasks such as database management and manipulation.

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80. (A) P-2, Q-1, R-4, S-3
India's major IT companies were established by visionary leaders. Infosys was co-founded by N.R. Narayana Murthy, while Azim Premji transformed Wipro into a global tech giant. Shiv Nadar was the key figure behind the rise of HCL Technologies. Tata Consultancy Services was led by F.C. Kohli, who is often called the "Father of the Indian IT Industry" for his leadership.

81. (C) Jira
Jira is a widely used project management and bug tracking tool developed by Atlassian. It is specifically designed for software development teams to plan, track, and manage their work. Jira allows developers and testers to report software bugs, assign them to team members, track their status, and ensure that all issues are resolved before the software is officially released.

82. (A) A situation where processes cannot proceed because each is waiting for the other's resource
A deadlock is a specific condition in an operating system where a set of processes are blocked because each process is holding a resource and waiting for another resource held by another

10. Identify the incorrect statement regarding the difference between a microprocessor and a microcontroller.
(A) A microprocessor primarily requires external memory to operate
(B) A microcontroller integrates a CPU, memory, and I/O ports on a single chip
(C) Microprocessors are generally used for specific, dedicated tasks
(D) Microcontrollers typically consume less power compared to microprocessors

11. Match the sensor types in List I with the parameters measured in List II.
List I: (Sensor Type)
P. Thermocouple
Q. Accelerometer
R. Photodiode
S. Piezoelectric sensor
List II: (Parameter Measured)
1. Light intensity
2. Pressure or force
3. Temperature
4. Change in velocity
Codes:
(A) P-3, Q-1, R-4, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-4, R-1, S-2

12. What is the primary function of a p-n junction diode in an electronic circuit?
(A) To amplify weak electrical signals
(B) To store electrical charge temporarily
(C) To permit unidirectional current flow through the circuit
(D) To step down high voltage to low voltage

13. In analog to digital conversion, the error introduced by approximating a continuous range of values to a finite set of discrete values is known as:
(A) Quantization noise
(B) Aliasing error
(C) Sampling error
(D) Thermal noise

14. A combinational logic circuit that performs the addition of three single-bit binary numbers is known as:
(A) Half Adder
(B) Multiplexer
(C) Full Adder
(D) Decoder

15. An electronic circuit that produces a periodic, oscillating electronic signal, often a sine wave or a square wave, without requiring an input signal is an:
(A) Amplifier
(B) Rectifier
(C) Attenuator
(D) Oscillator

16. Which of the following is a primary advantage of digital signals over analog signals?
(A) Higher resistance to noise and signal degradation
(B) Reduced bandwidth requirements for data transmission
(C) Infinite resolution due to their continuous nature
(D) Zero processing requirements prior to transmission

17. What is the primary function of an inverter in power electronics?
(A) To convert DC to AC
(B) To step up DC voltage
(C) To convert AC to DC
(D) To step down AC voltage

18. The first commercial microprocessor, the Intel 4004, was developed in which year?
(A) 1971
(B) 1965
(C) 1980
(D) 1985

19. Consider the following statements regarding Frequency Modulation (FM):
I. FM provides better noise immunity compared to AM.
II. FM operates in a lower frequency range than typical AM broadcasting.
III. The bandwidth required for FM is generally wider than that for AM.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I, II, and III
(D) I and III only

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software systems to interact over the web using standard methods like GET and POST. This approach is widely used in modern web development for its simplicity, scalability, and high performance.

92. (C) Rewarding independent researchers for reporting software vulnerabilities
A bug bounty program is a security initiative where technology companies reward independent security researchers and ethical hackers for discovering and reporting software vulnerabilities. By offering financial incentives or recognition, companies can identify security flaws before malicious actors exploit them. This collaborative approach significantly enhances the overall security and robustness of software applications and protects user data from potential cyber threats.

93. (D) Structured Query Language
SQL stands for Structured Query Language, which is the standard programming language used for managing and manipulating relational databases. It allows users to perform various tasks such as querying data, updating records, and creating new tables. Its structured nature makes it an essential tool for data analysts and software developers who need to interact with large volumes of organized information efficiently.

94. (C) Java / Kotlin
The Android mobile operating system primarily uses Java and Kotlin for its native application development. While Java has been the traditional language for Android since its inception, Kotlin was later introduced and is now the preferred language due to its modern features and improved safety. These languages allow developers to create powerful and efficient apps that can fully utilize the Android platform.

95. (A) It converts high-level code into machine code
The primary purpose of a compiler is to translate source code written in a high-level programming language into machine code that a computer's processor can understand and execute. This translation process occurs all at once, creating a separate executable file. By converting human-readable instructions into binary format, compilers enable software to run efficiently on specific hardware architectures and operating environments.

96. (B) Firewall
A firewall is a critical security component that monitors and controls all incoming and outgoing network traffic. Based on a set of predefined security rules, it decides whether to allow or block specific data packets. This acts as a barrier between a trusted internal network and untrusted external networks like the internet, preventing unauthorized access and protecting systems from cyber threats.

97. (A) PostgreSQL
PostgreSQL is a powerful and popular open-source relational database management system. It is known for its reliability, data integrity, and support for complex queries. Being open-source, it allows users to access the source code and modify it to suit their specific needs without paying expensive licensing fees. This makes it a preferred choice for many organizations worldwide for data-intensive applications.

98. (B) DigiLocker
DigiLocker is a flagship initiative of the Government of India under the Digital India program. It serves as a secure digital document wallet, allowing citizens to store and access official documents like driving licenses and identity proofs in a digital format. Integrated with Aadhaar for authentication, it promotes paperless governance and makes the verification process faster and more convenient for citizens.

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99. (D) It copies all files changed since the last full backup
A differential backup strategy focuses on copying all files that have changed since the last full backup was performed. This differs from an incremental backup, which only copies files that have changed since the very last backup of any kind. While differential backups take more time and storage space as more changes accumulate, they offer a faster restoration process than incremental sequences.

100. (D) System Call
A system call is the programmatic way in which a computer program requests a service from the kernel of the operating system. It provides

process in the set. Since none of the processes can move forward, the system remains in a stalled state. This requires the operating system to use specific algorithms for resolution.

83. (D) A is false but R is true.
Contrary to a common misconception, open-source software is not exempt from copyright laws. Instead, open-source licenses like the GNU GPL use copyright to enforce their terms. These terms require that any modifications or redistributions of the software must remain open-source. This ensures that the code remains freely available to the community while still recognizing the original author's copyright protections.

84. (C) It enlarges a portion of the screen to assist users with low vision
A screen magnifier is an accessibility tool designed to assist users with low vision or other visual impairments. It works by enlarging a portion of the computer screen, making text and images much easier to see. Users can typically adjust the level of magnification and move the enlarged area to follow the mouse cursor as they navigate the system interface.

85. (A) Planning, Design, Implementation, Testing, Maintenance
The Software Development Life Cycle follows a logical sequence of stages to ensure high-quality software. It begins with planning to define goals and requirements. Next, the design phase creates a technical blueprint. This is followed by implementation, where the actual code is written. Testing then identifies and fixes bugs, and finally, maintenance ensures the software remains functional after deployment.

86. (B) To provide secure cloud-based storage for personal and official documents
DigiLocker is a key initiative under the Digital India program that provides citizens with a secure, cloud-based platform for storing and managing their personal and official documents. By offering a digital wallet for items like academic certificates and identity proofs, it enables paperless governance. This reduces the need for physical documents and allows for easier verification by authorized agencies.

87. (B) iOS
The iOS mobile operating system uses a "sandbox" architecture as a fundamental security measure. This approach strictly isolates each application from other apps and from the core system files. By limiting an application's access to only its own data and specific system services, the sandbox prevents malicious software from stealing personal information or causing damage to the device's environment.

88. (A) Both A and R are true and R is the correct explanation of A.
A compiler is generally faster than an interpreter because it translates the entire source code into a standalone machine-code executable before the program is run. This allows the computer's processor to execute the pre-compiled instructions directly. An interpreter must translate each line of code at runtime, which adds significant overhead and results in slower execution compared to compiled programs.

89. (B) Command Line Interface (CLI)
A Command Line Interface is a type of user interface where the user interacts with the operating system by typing specific text commands. Unlike a Graphical User Interface, which uses icons and windows, the CLI is entirely text-based. It is highly efficient for advanced users and system administrators, allowing for precise control and automation of complex tasks through scripted commands.

90. (A) P-2, Q-1, R-4, S-3
Different operating systems are designed for specific tasks. Real-time systems manage time-critical applications like missile guidance. Batch systems process repetitive tasks like payroll without user interaction. Time-sharing systems allow multiple users to share a computer's resources simultaneously. Distributed systems connect multiple independent computers over a network to work together as a single, powerful unit for complex processing needs.

91. (B) Representational State Transfer
REST stands for Representational State Transfer, which is an architectural style for designing networked applications. It relies on a stateless, client-server communication protocol, most commonly HTTP. REST APIs allow different

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CHAPTER 15

Electronics and Digital Fundamentals

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1. Which generation of Integrated Circuits (ICs) introduced the capability of housing thousands of electronic components on a single chip?
(A) Small Scale Integration (SSI)
(B) Medium Scale Integration (MSI)
(C) Ultra Large Scale Integration (ULSI)
(D) Large Scale Integration (LSI)

2. Amplitude Modulation (AM) is a technique where the amplitude of the carrier wave is varied in accordance with:
(A) The basic frequency of the modulating signal
(B) The relative phase of the modulating signal
(C) The modulating signal's instantaneous magnitude
(D) The total bandwidth of the carrier waveform

3. In intrinsic semiconductors, how does the number of electrons compare to the number of holes at room temperature?
(A) The electron count is significantly higher than the hole count
(B) The hole count is significantly higher than the electron count
(C) The electron and hole concentrations are exactly identical
(D) Both charge carrier types are completely absent from the material

4. Consider the following statements regarding Printed Circuit Boards (PCBs):
I. They mechanically support electronic components.
II. They connect components electrically using conductive pathways.
III. FR-4 is a widely used material for making PCB substrates.
IV. Surface Mount Technology (SMT) cannot be used on modern PCBs.
Which of the above statement(s) is/are correct?
(A) I, II, and IV only
(B) II, III, and IV only
(C) I, II, and III only
(D) I, III, and IV only

5. Which of the following combinations of logic gates are known as Universal Gates?
(A) AND and OR
(B) NAND and NOR
(C) NOT and XOR
(D) XOR and XNOR

6. Which of the following display technologies emits its own light and does not require a backlight?
(A) LCD
(B) OLED
(C) LED-backlit LCD
(D) TFT-LCD

7. Which of the following best describes an electrical signal in the context of electronics?
(A) A steady state of voltage that remains constant indefinitely
(B) A time-varying voltage or current used to convey information
(C) A purely mechanical wave that travels through conductive wires
(D) An invisible force field generated by static insulators

8. The process of converting a continuous-time analog signal into a discrete-time signal is called:
(A) Quantization
(B) Sampling
(C) Encoding
(D) Modulation

9. Which of the following best defines the term VLSI in electronics?
(A) Very Low Signal Intensity
(B) Very Large Scale Integration
(C) Variable Logic State Integration
(D) Voltage Level Signal Interface

(B) Sequential circuits lack memory and use only logic gates
(C) Combinational circuits are designed for memory storage tasks
(D) Output depends on both current and previous input states

31. Which frequency band in 5G networks provides the highest data transfer speeds and lowest latency but covers the shortest distance?
(A) Low-band sub-1 gigahertz frequencies
(B) Mid-band 1 to 6 gigahertz range
(C) High-band millimeter wave spectrum
(D) Ultra-low band experimental spectrum

32. A device that routes data from multiple input lines to a single output line based on control signals is called a:
(A) Demultiplexer
(B) Multiplexer
(C) Decoder
(D) Encoder

33. Under India's E-Waste (Management) Rules, the principle that makes manufacturers responsible for the end-of-life disposal of their products is called:
(A) Corporate Social Responsibility
(B) Extended Producer Responsibility
(C) Manufacturer Liability Protocol
(D) Circular Economy Mandate

34. What does the term "Smart Grid" refer to in the context of electrical infrastructure?
(A) Solar-powered isolated electrical generation systems
(B) Communication-only networks for transmission data
(C) Traditional power grids without manual monitoring
(D) Digitally managed electricity transmission networks

35. The following question consists of two statements regarding smart meters. Read the statements and select the correct option.
Statement I: Smart meters allow two-way communication between the utility provider and the consumer's premises.
Statement II: Smart meters eliminate the need for manual meter reading and enable real-time tracking of electricity usage.
(A) Both Statement I and Statement II are true
(B) Both Statement I and Statement II are false
(C) Statement I is true but Statement II is false
(D) Statement I is false but Statement II is true

36. The unit of measurement for electrical inductance is:
(A) Henry
(B) Farad
(C) Ohm
(D) Hertz

37. Which of the following represents the hardware layer of an Internet of Things (IoT) architecture?
(A) Physical sensing and actuation hardware
(B) Networked servers and analytic engines
(C) Digital interfaces and user applications
(D) Security protocols and firewall software

38. The fundamental building block of an integrated circuit is the:
(A) Vacuum tube
(B) Transformer
(C) Relay
(D) Transistor

39. Which material is most commonly used as the semiconductor base for manufacturing modern integrated circuits?
(A) Germanium
(B) Gallium Arsenide
(C) Silicon Carbide
(D) Silicon

40. Radio Frequency Identification (RFID) systems are typically categorized into two main types based on their power source. What are they?
(A) Analog and Digital
(B) Synchronous and Asynchronous
(C) Static and Dynamic
(D) Active and Passive

41. Select the correct sequence of events when an RFID reader reads a passive RFID tag:
(A) Tag transmits data, Reader receives data, Reader sends radio waves to power the tag
(B) Reader sends radio waves, Tag is powered by waves, Tag reflects back a signal with its data
(C) Tag powers itself via battery, Tag sends

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20. The following question consists of two statements—Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Flip-flops are fundamental building blocks of digital memory devices.
Reason (R): A flip-flop is a bistable multivibrator capable of storing one bit of data.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

21. A device that converts an electrical control signal into a mechanical motion in an IoT system is known as a:
(A) Sensor
(B) Transceiver
(C) Actuator
(D) Microcontroller

22. A bipolar junction transistor (BJT) operates primarily as which of the following?
(A) A voltage-controlled current source
(B) A current-controlled current source
(C) A voltage-controlled voltage source
(D) A current-controlled voltage source

23. Which of the following logic gates outputs a high (1) signal only when all its inputs are high (1)?
(A) OR Gate
(B) XOR Gate
(C) NAND Gate
(D) AND Gate

24. Identify the odd one out among the following electronic components.
(A) Resistor
(B) Capacitor
(C) Inductor
(D) Transistor

25. According to the Nyquist-Shannon sampling theorem, what is the minimum sampling frequency required to perfectly reconstruct a signal with a maximum frequency of fm?
(A) Equal to fm
(B) Greater than or equal to 2fm
(C) Greater than or equal to 4fm
(D) Less than 2fm

26. Which of the following materials is universally recognized as the best electrical conductor at room temperature?
(A) Copper
(B) Gold
(C) Aluminum
(D) Silver

27. In signal processing, the Fourier Transform is primarily used to:
(A) Perform time-to-frequency domain transformations
(B) Maximize the peak voltage levels of a signal
(C) Reconstitute digital signals into analog forms
(D) Execute data compression for secure encryption

28. Match the electronic components in List I with their primary functions in List II.
List I: (Electronic Component)
P. Diode
Q. Transistor
R. Capacitor
S. Resistor
List II: (Primary Function)
1. Opposes the flow of current
2. Stores electrical energy in an electric field
3. Acts as an amplifier or switch
4. Rectifies alternating current
Codes:
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-2, R-3, S-1
(D) P-1, Q-2, R-4, S-3

29. Which digital modulation technique changes the frequency of the carrier wave to represent binary data?
(A) Amplitude Shift Keying (ASK)
(B) Phase Shift Keying (PSK)
(C) Frequency Shift Keying (FSK)
(D) Quadrature Amplitude Modulation (QAM)

30. What distinguishes a sequential circuit from a combinational circuit?
(A) Sequential circuits operate without an external power supply

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50. Arrange the following memory types in decreasing order of their typical operational speed (fastest to slowest):
I. Cache Memory
II. CPU Registers
III. Magnetic Hard Drive
IV. Main Memory (RAM)
Select the correct order:
(A) I, II, IV, III
(B) II, I, IV, III
(C) II, IV, I, III
(D) I, IV, II, III

51. Which digital circuit is used to perform high-speed counting operations in microprocessors?
(A) Multiplexer
(B) Decoder
(C) Shift Register
(D) Counter

52. India's first dedicated E-waste clinic, designed for segregating, processing, and disposing of electronic waste, was inaugurated in which city of Madhya Pradesh?
(A) Bhopal
(B) Indore
(C) Gwalior
(D) Jabalpur

53. Near Field Communication (NFC) technology typically operates effectively over what maximum distance?
(A) Up to 10 meters
(B) Up to 100 meters
(C) Up to 4 centimeters
(D) Up to 1 kilometer

54. The Design Linked Incentive (DLI) scheme under the India Semiconductor Mission specifically aims to support:
(A) Importing raw materials for large fabrication units
(B) Decommissioning outdated semiconductor facilities
(C) Domestic semiconductor chip design infrastructure
(D) Distribution of consumer mobile devices to citizens

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55. Which electronic component is used to restrict the flow of electrical current and drop voltage in a circuit?
(A) Resistor
(B) Inductor
(C) Diode
(D) Capacitor

56. India's first dedicated E-waste clinic, designed for segregating, processing, and disposing of electronic waste, was inaugurated in which city of Madhya Pradesh?
(A) Bhopal
(B) Indore
(C) Gwalior
(D) Jabalpur

57. Which of the following is an active electronic component?
(A) Transistor
(B) Resistor
(C) Inductor
(D) Capacitor

58. Select the correct sequence of steps involved in a typical Analog to Digital Conversion (ADC) process:
(A) Encoding, Quantization, Sampling
(B) Sampling, Quantization, Encoding
(C) Quantization, Sampling, Encoding
(D) Sampling, Encoding, Quantization

59. The process of modifying the phase of a carrier wave to encode digital data is called:
(A) Frequency Shift Keying (FSK)
(B) Amplitude Shift Keying (ASK)
(C) Phase Shift Keying (PSK)
(D) Pulse Width Modulation (PWM)

60. What is the primary purpose of radiation-hardened (rad-hard) electronics used in ISRO space payloads?
(A) Protecting devices from low temperature failures
(B) Guarding circuits against spaceborne ionization
(C) Maximizing the clock speed of microprocessors
(D) Minimizing component weight inside the rocket

signal, Reader intercepts signal
(D) Reader connects to internet, Reader requests data from Tag, Tag sends data

42. Consider the following statements about the Production Linked Incentive (PLI) scheme for Large Scale Electronics Manufacturing in India:
I. It aims to boost domestic manufacturing and attract large investments.
II. It offers financial incentives based on incremental sales of manufactured goods.
III. The scheme exclusively targets the manufacturing of smart televisions.
IV. Mobile phones and specified electronic components are covered under it.
V. The scheme is administered by the Ministry of Electronics and IT (MeitY).
Which of the above statement(s) is/are correct?
(A) I, III, IV, and V only
(B) II, III, IV, and V only
(C) I, II, IV, and V only
(D) I, II, III, and IV only

43. Identify the incorrect statement about digital logic gates.
(A) A NOT gate reverses the logic state of its input
(B) An AND gate yields high output for any high input
(C) An OR gate yields high output for any high input
(D) A NAND gate functions as an inverted AND gate

44. Which defense electronics system developed by DRDO is an Airborne Early Warning and Control (AEW&C) system?
(A) Astra
(B) Nag
(C) Pinaka
(D) Netra

45. The "Make in India" initiative for the electronics sector focuses heavily on reducing import dependence. What is the Phased Manufacturing Programme (PMP)?
(A) Scheduled decommissioning of legacy electronics
(B) Multi-phase pre-market reliability testing cycles
(C) Component manufacturing via gradual import duties
(D) Relocation of factories to designated rural zones

46. In wearable electronics, which type of sensor is commonly used in smartwatches to measure heart rate optically?
(A) Electrocardiogram (ECG) sensor
(B) Photoplethysmography (PPG) sensor
(C) Galvanic Skin Response (GSR) sensor
(D) Bioimpedance sensor

47. Identify the correct pair regarding the types of electronic displays.
(A) LCD - Uses organic light emitting compounds
(B) LED display - Backlit liquid crystal layer system
(C) OLED - Backlight dependent liquid crystal array
(D) Plasma display - Noble gas-free transistor screen

48. The implementation of "Massive MIMO" in 5G hardware refers to:
(A) Traffic control management operations
(B) Capacity-multiplying antenna systems
(C) Satellite-based independent systems
(D) Internal mobile operating platforms

49. Match the electronic terms in List I with their descriptions in List II.
List I: (Electronic Terms)
P. Clock Signal
Q. Flip-Flop
R. Register
S. Counter
List II: (Descriptions)
1. A group of flip-flops used to store multiple bits of data
2. A sequential circuit that counts the number of input pulses
3. A continuous square wave used to synchronize digital circuits
4. A 1-bit memory cell
Codes:
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-2, Q-4, R-1, S-3

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an interface between a running process and the operating system. System calls are essential for performing tasks that require hardware access or protected system resources, such as managing memory or performing various input and output operations.

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61. Which of the following impurities is added to Silicon to create an n-type semiconductor?
(A) Boron
(B) Gallium
(C) Phosphorus
(D) Indium

62. The technology used to assemble electronic components directly onto the surface of a printed circuit board is called:
(A) Surface Mount Technology (SMT)
(B) Through-Hole Technology (THT)
(C) Wire Wrapping
(D) Point-to-Point Construction

63. Identify the exception among the following features of a Microcontroller.
(A) General-purpose desktop computing usage
(B) Central Processing Unit integration
(C) Internal RAM and ROM modules
(D) Integrated I/O peripheral systems

64. Consider the following statements about consumer electronics trends:
I. There is a growing shift towards smart appliances integrated with IoT.
II. The demand for energy-efficient devices has decreased.
III. Miniaturization of electronic components is a continuing trend.
IV. Wearable technology is exclusively limited to the healthcare sector.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and IV only
(C) I and III only
(D) III and IV only

65. Which component is responsible for holding the address of the next instruction to be executed by the microprocessor?
(A) Program Counter
(B) Accumulator
(C) Arithmetic Logic Unit
(D) Instruction Decoder

66. NavIC, India's regional navigation satellite system, relies on highly accurate electronic timing hardware. Which specific type of clock is used in NavIC satellites?
(A) Atomic Clock
(B) Quartz Clock
(C) Mechanical Clock
(D) Pendulum Clock

67. Which organization leads the development of defense electronics, including radars and electronic warfare systems, in India?
(A) ISRO
(B) HAL
(C) DRDO
(D) BARC

68. What is the primary function of a capacitor in a DC power supply circuit?
(A) Voltage reduction and step-down conversion
(B) Filtering and pulsating DC smoothing
(C) Rectification of AC into DC signals
(D) Increasing the frequency of current flow

69. Which of the following is a key component of an Internet of Things (IoT) edge computing architecture?
(A) Processing data locally near the source of generation
(B) Sending all raw data to a centralized cloud for processing
(C) Eliminating the use of sensors entirely
(D) Using analog signals for all network communication

70. A Zener diode is primarily used in electronic circuits for:
(A) High-speed switching
(B) Current amplification
(C) Voltage regulation
(D) Emitting light

71. Match the electronic waste categories in List I with the typical items in List II.
List I: (Electronic Waste Category)
P. Large Household Appliances
Q. IT and Telecommunications Equipment
R. Consumer Equipment
S. Lighting Equipment
List II: (Typical Item)
1. Smartphone
2. Television
3. Refrigerator
4. Fluorescent lamp
Codes:
(A) P-3, Q-1, R-2, S-4

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encourage companies to manufacture them locally instead of importing finished parts. This step-by-step approach helps build local expertise and reduces India's dependence on foreign electronic supplies.

46. (B) Photoplethysmography (PPG) sensor
Photoplethysmography is a common optical technique used in wearable devices to measure heart rate. It works by shining light into the skin and measuring the changes in light absorption caused by blood flow variations during each heartbeat. This non-invasive method is integrated into most smartwatches and fitness trackers to provide users with continuous heart rate monitoring data conveniently.

47. (B) LED display - Backlit liquid crystal layer system
A standard LED display in consumer electronics is actually a liquid crystal display that uses light-emitting diodes as its backlight source. While OLED displays consist of organic compounds that emit their own light without a backlight, LED-backlit LCDs rely on a separate layer of LEDs to illuminate the pixels. This distinction is important for understanding modern screen technologies correctly.

48. (B) Capacity-multiplying antenna systems
Massive Multiple-Input Multiple-Output is a key technology used in 5G hardware that involves using a very large number of antennas at base stations. This system allows for the simultaneous transmission and reception of multiple data signals, significantly increasing network capacity and spectral efficiency. It helps in managing high-traffic areas and providing faster, more reliable connections to many users simultaneously.

49. (A) P-3, Q-4, R-1, S-2
Electronic circuits rely on specific components for timing and storage. A clock signal provides a synchronized timing reference using a continuous square wave. A flip-flop serves as a basic memory cell for a single bit, while a register combines several flip-flops to store multiple bits. Finally, a counter is a sequential circuit used to track the number of pulses accurately.

50. (B) II, I, IV, III
CPU registers are the fastest memory type because they are located directly inside the processor core for immediate access. Cache memory is the next fastest, serving as a buffer between the registers and main memory. RAM follows with moderate speed for active data storage. Magnetic hard drives are significantly slower due to their mechanical nature and external interface requirements for data.

51. (D) Counter
A counter is a specialized sequential logic circuit used in microprocessors and digital systems to count pulses or track events. It is typically constructed from a series of flip-flops that change states in response to a clock signal. These devices are essential for timing, frequency division, and managing the sequence of operations within complex computational hardware and digital systems.

52. (A) Bhopal
India's first dedicated e-waste clinic was established in Bhopal, Madhya Pradesh, through a joint initiative of the Bhopal Municipal Corporation and the Central Pollution Control Board. This facility focuses on the scientific segregation, processing, and disposal of electronic waste from both households and commercial units. It aims to reduce environmental hazards associated with improper e-waste management in the region.

53. (C) Up to 4 centimeters
Near Field Communication is a short-range wireless technology designed for secure data exchange between devices. It typically operates effectively only within a very short distance, usually around four centimeters or less. This limited range is a deliberate security feature, making it highly suitable for applications like contactless payments and secure access control where proximity is strictly required for data.

54. (C) Domestic semiconductor chip design infrastructure
The Design Linked Incentive scheme is a component of the India Semiconductor Mission specifically focused on fostering the domestic chip design ecosystem. It provides financial and infrastructure support to local companies

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81. Which DRDO laboratory is primarily focused on the research and development of Electronic Warfare (EW) systems?
(A) Defence Research and Development Establishment (DRDE), Gwalior
(B) Combat Vehicles Research and Development Establishment (CVRDE), Chennai
(C) Defence Electronics Research Laboratory (DLRL), Hyderabad
(D) Naval Materials Research Laboratory (NMRL), Ambernath

82. In electronics, what does the term 'doping' refer to?
(A) Controlled impurity addition to semiconductors
(B) Application of insulation to conductive wiring
(C) Transistor miniaturization for microchip density
(D) Circuit operation beyond rated voltage limits

83. Moore's Law, a historical observation in the electronics industry, originally stated that:
(A) Network speeds double on an annual basis
(B) Manufacturing costs double every ten years
(C) Component power usage halves every year
(D) Chip transistor counts double every two years

84. Which of the following materials is classified as a semiconductor?
(A) Copper
(B) Glass
(C) Silicon
(D) Rubber

85. Which semiconductor material is most preferred for making high-power and high-frequency electronic devices due to its wide bandgap?
(A) Standard Silicon base
(B) Germanium crystalline base
(C) Wide bandgap Silicon Carbide
(D) Lead Telluride compound base

86. What happens when an amplifier is driven by an input signal that is too large for it to handle?
(A) Signal aliasing
(B) Signal clipping
(C) Signal quantization
(D) Signal filtering

87. Which effect is responsible for the operation of a Light Emitting Diode (LED)?
(A) Thermoelectric effect
(B) Electroluminescence
(C) Photoelectric effect
(D) Piezoelectric effect

88. Match the modulation techniques in List I with their characteristics or uses in List II.
List I: (Modulation Technique)
P. Amplitude Modulation (AM)
Q. Frequency Modulation (FM)
R. Pulse Code Modulation (PCM)
S. Phase Shift Keying (PSK)
List II: (Characteristic/Use)
1. Highly susceptible to noise, used in short-wave radio
2. Used extensively in digital audio and telephony
3. Digital modulation used in wireless LANs
4. High-fidelity audio broadcasting
Codes:
(A) P-1, Q-2, R-4, S-3
(B) P-1, Q-4, R-2, S-3
(C) P-4, Q-1, R-3, S-2
(D) P-2, Q-3, R-1, S-4

89. In the context of microprocessors, the term "clock speed" refers to:
(A) The time it takes to boot the computer
(B) The number of cycles the processor executes per second
(C) The speed at which data travels over the internet
(D) The rotational speed of the hard drive

90. Which type of sequential circuit is used to store multiple bits of data in a microprocessor?
(A) Register
(B) Multiplexer
(C) Encoder
(D) Decoder

91. Which of the following is a major advantage of using OLED displays over traditional LCDs?
(A) OLEDs have higher power consumption
(B) OLEDs offer deeper blacks and higher contrast ratios
(C) OLEDs require a dedicated backlight

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(D) OLEDs are entirely immune to screen burn-in

92. A shift register is a type of sequential logic circuit primarily used for:
(A) Analog-to-digital signal conversion tasks
(B) Amplifying digital signal voltage levels
(C) Converting between serial and parallel data formats
(D) Execution of complex multiplier logic

93. The RoHS directive, globally influential in electronics manufacturing, restricts the use of certain materials. What does RoHS stand for?
(A) Removal of Harmful Semiconductors
(B) Regulation of Heavy Silicon
(C) Recycling of Hardware Systems
(D) Restriction of Hazardous Substances

94. In the context of Indian space electronics, the term 'payload' typically refers to:
(A) Launch vehicle propellant and liquid fuel
(B) Structural elements of the rocket body
(C) Mission-specific scientific and electronic gear
(D) Astronaut personnel onboard the craft

95. Arrange the following telecommunication network generations in chronological order of their widespread deployment in India:
I. 5G
II. 2G
III. 4G
IV. 3G
Select the correct order:
(A) II, IV, III, I
(B) IV, II, III, I
(C) II, III, IV, I
(D) IV, III, II, I

96. Which of the following best describes the function of a flip-flop in digital electronics?
(A) It generates a continuous square wave
(B) It stores a single bit of binary data
(C) It adds two binary digits together
(D) It converts alternating current to direct current

97. In power electronics, a device that converts a fixed DC voltage to a variable DC voltage is known as a:
(A) Chopper (DC-DC Converter)
(B) Rectifier
(C) Inverter
(D) Cycloconverter

98. What is the primary purpose of tokenization in NFC-based electronic payments?
(A) Boosting the effective signal range of NFC
(B) Secure replacement of sensitive card data
(C) Powering the mobile device during payment
(D) Batch processing of simultaneous payments

99. Which of the following is an example of an unguided (wireless) transmission medium used in modern electronics communication?
(A) Coaxial cable
(B) Optical fiber
(C) Twisted pair cable
(D) Free space (Radio waves)

100. Which logic gate is often referred to as an "inverter"?
(A) AND Gate
(B) OR Gate
(C) XOR Gate
(D) NOT Gate

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ANSWERS

1. (D) Large Scale Integration (LSI)
Large Scale Integration represents a significant milestone in microelectronics development where thousands of transistors are integrated onto a single silicon chip. This level of density enabled the production of complex digital circuits like early microprocessors and memory chips. It bridges the gap between medium-scale integration and the even denser very-large-scale integration levels found in modern computing hardware.

2. (C) The modulating signal's instantaneous magnitude
In Amplitude Modulation, the strength or height of the high-frequency carrier signal is modified to match the information signal's amplitude. As the magnitude of the input data changes, the carrier wave expands or contracts accordingly while its frequency remains constant. This technique allows for the transmission of audio signals over long distances via radio and is a fundamental communication process.

3. (C) The electron and hole concentrations are exactly identical
Intrinsic semiconductors are pure materials like silicon or germanium without any added impurities. At room temperature, thermal energy causes some valence electrons to break free and move into the conduction band, leaving behind vacant spots called holes. Because every free electron creates exactly one corresponding hole, the concentrations of these charge carriers remain perfectly balanced within the material's structure.

4. (C) I, II, and III only
Printed Circuit Boards provide both structural support and electrical connectivity for electronic components. They use conductive tracks etched from copper sheets laminated onto a non-conductive substrate, commonly made of FR-4 material. While Surface Mount Technology is a standard modern assembly method, the assertion that it cannot be used on contemporary boards is factually incorrect and logically false for today.

5. (B) NAND and NOR
NAND and NOR gates are classified as universal logic gates because any other boolean function can be implemented using only these specific types. This versatility is crucial in digital circuit design and manufacturing, as it allows for the construction of complex processors using a single, simplified gate architecture. They form the essential foundation of almost all modern digital integrated circuitry systems.

6. (B) OLED
Organic Light Emitting Diode technology utilizes organic compounds that emit light when an electric current is applied. Unlike Liquid Crystal Displays which require a separate backlight panel to illuminate pixels, each OLED pixel produces its own light. This self-emissive nature allows for thinner screens, better energy efficiency, and much deeper black levels in modern display panels for consumer electronic devices.

7. (B) A time-varying voltage or current used to convey information
An electrical signal is a physical quantity that changes over time to represent or carry information between different parts of a system. In electronic circuits, this typically manifests as variations in voltage or current levels. These fluctuations can be analog, representing a continuous range of values, or digital, where information is encoded into discrete binary states for subsequent computational processing.

8. (B) Sampling
Sampling is the fundamental process of measuring an analog signal's value at specific, regular intervals to convert it into a discrete-time representation. This step is essential in digital signal processing as it bridges the gap between continuous physical phenomena and digital computation. The frequency of these measurements must be sufficiently high to capture all relevant information accurately from the source.

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9. (B) Very Large Scale Integration
Very Large Scale Integration refers to the complex process of creating integrated circuits by combining millions of MOS transistors into a single chip. This technology revolutionized the electronics industry by enabling the development of powerful microprocessors and high-density memory. It allows for extreme miniaturization, reduced power consumption, and increased performance in modern computers and mobile communication devices used globally today.

10. (C) Microprocessors are generally used for specific, dedicated tasks
Microprocessors are general-purpose units designed to perform a wide variety of computational tasks, typically requiring external memory and peripherals. In contrast, microcontrollers are specialized chips containing a CPU, memory, and input/output ports on a single integrated circuit, usually dedicated to specific control functions. The claim that microprocessors are generally used for dedicated tasks is incorrect and fundamentally misleading.

11. (D) P-3, Q-4, R-1, S-2
Different sensors are designed to detect specific physical properties and convert them into electrical signals. Thermocouples measure temperature through voltage changes, while accelerometers detect changes in velocity. Photodiodes respond to light intensity by generating current, and piezoelectric sensors produce a voltage when subjected to mechanical pressure. These devices are critical components in modern automated measurement and control systems.

12. (C) To permit unidirectional current flow through the circuit
The primary function of a p-n junction diode is to allow electric current to flow in one direction while blocking it in the opposite direction. This property, known as rectification, is achieved by the unique behavior of the depletion region at the junction of p-type and n-type materials. It is essential for converting alternating current into direct current in power supplies.

13. (A) Quantization noise
Quantization noise represents the inherent error introduced when a continuous analog signal is mapped onto a finite set of discrete digital levels. Because the digital representation can only approximate the actual analog value, a small difference or rounding error remains. This phenomenon affects the signal-to-noise ratio and is a key consideration when determining the bit-depth of various electronic converters.

14. (C) Full Adder
A full adder is a combinational logic circuit specifically designed to add three single-bit binary numbers. It takes two significant bits and an incoming carry bit as inputs, producing a sum bit and an outgoing carry bit as outputs. This circuit is a fundamental building block in the arithmetic logic units of computers, enabling multi-bit binary addition operations in processors.

15. (D) Oscillator
An oscillator is an electronic circuit that generates a repetitive, oscillating signal, such as a sine or square wave, by converting direct current into alternating current. It operates based on positive feedback and does not require an external input signal to maintain its output. These devices are used in everything from radio transmitters and computers to simple quartz timing watches.

16. (A) Higher resistance to noise and signal degradation
Digital signals offer superior resistance to noise and interference compared to analog signals because they rely on discrete binary states. Even if a digital signal undergoes slight degradation during transmission, it can often be perfectly reconstructed as long as the logic levels remain distinguishable. This robustness ensures higher data integrity and reliability across various communication channels and modern storage media.

17. (A) To convert DC to AC
An inverter is a power electronic device used to change direct current into alternating current. This conversion is vital for powering household appliances from batteries or solar panels, which naturally produce DC. By using high-speed switching circuits, the inverter creates an AC waveform at the desired frequency and voltage level required by the load or the utility grid.

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18. (A) 1971
The Intel 4004, introduced in 1971, is recognized as the world's first commercially available single-chip microprocessor. It was a 4-bit CPU that integrated over two thousand transistors, paving the way for the personal computer revolution. Its development marked the shift from multiple integrated circuits to a single programmable device capable of performing complex logical and arithmetic processing for electronics.

19. (D) I and III only
Frequency Modulation provides superior noise immunity because information is encoded in frequency changes rather than amplitude, which is more susceptible to atmospheric interference. However, achieving this higher signal quality requires a significantly wider bandwidth than standard Amplitude Modulation. While FM is highly efficient for high-fidelity broadcasting, it typically operates in much higher frequency ranges than traditional AM radio networks.

20. (A) Both A and R are true and R is the correct explanation of A.
Flip-flops serve as the basic memory elements in digital systems because they can maintain one of two stable states. This bistable nature allows them to store a single bit of information indefinitely as long as power is supplied. Consequently, they are essential for creating registers and larger memory arrays, making the explanation of their storage capability directly relevant for hardware.

21. (C) Actuator
An actuator is a component in an Internet of Things system that receives an electrical command from a controller and converts it into physical movement. This can include opening a valve, rotating a motor, or engaging a switch. Actuators act as the interface between the digital decision-making process and the physical environment, enabling automated systems to perform real-world actions.

22. (B) A current-controlled current source
A bipolar junction transistor functions as a current-controlled device where a small amount of current flowing into the base terminal regulates a much larger current between the collector and emitter terminals. This property allows the transistor to act as an amplifier or a switch in electronic circuits. The relationship between the input and output currents is defined by the gain factor.

23. (D) AND Gate
The AND gate is a basic digital logic gate that produces a high output, represented by a binary one, only if all of its input signals are simultaneously high. If any input is low or zero, the output will also be low. This logical behavior is fundamental for implementing conditional operations and synchronization within complex digital integrated circuits and processors.

24. (D) Transistor
In this group, resistors, capacitors, and inductors are categorized as passive components because they do not require an external power source to function and cannot amplify signals. In contrast, a transistor is an active component capable of controlling the flow of electricity and providing gain. Its ability to amplify or switch signals distinguishes it from the other passive components listed.

25. (B) Greater than or equal to 2fm
The Nyquist-Shannon sampling theorem states that to reconstruct a continuous signal from its samples without losing information, the sampling frequency must be at least twice the highest frequency present in the original signal. This minimum rate prevents aliasing, which occurs when high-frequency components are incorrectly mapped to lower frequencies, distorting the digital representation of the signal significantly.

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26. (D) Silver
Silver is widely recognized as the most efficient electrical conductor among all metals at room temperature due to its high density of free electrons. While copper and aluminum are more commonly used in wiring because of their lower cost, silver's superior conductivity makes it ideal for specialized applications like high-end audio connectors and precision electronic components requiring minimal electrical resistance.

27. (A) Perform time-to-frequency domain transformations
The Fourier Transform is a critical mathematical tool in signal processing used to decompose

a time-varying signal into its constituent frequencies. By shifting from the time domain to the frequency domain, engineers can analyze the spectral content of a signal, design filters, and perform data compression. It reveals the various sine waves that combine to form the original waveform.

28. (A) P-4, Q-3, R-2, S-1
Electronic components have distinct primary roles: diodes rectify current by allowing it to flow in only one direction, while transistors serve as amplifiers or switches. Capacitors store electrical energy within an electric field, and resistors provide opposition to the flow of current. Together, these components form the building blocks for creating complex circuits and advanced digital electronic systems.

29. (C) Frequency Shift Keying (FSK)
Frequency Shift Keying is a digital modulation method where the frequency of a carrier wave is shifted between two or more discrete values to represent binary data. For instance, one frequency might represent a logic zero while a different frequency represents a logic one. This technique is commonly used in telecommunications, including legacy modems and various wireless communication systems.

30. (D) Output depends on both current and previous input states
Sequential circuits are distinguished from combinational circuits by their ability to store information, meaning their output depends on both current inputs and the history of previous inputs. This memory characteristic is typically achieved through the use of flip-flops. In contrast, the output of a combinational circuit is determined solely by its current input values at any given time.

31. (C) High-band millimeter wave spectrum
The high-band millimeter wave spectrum in 5G technology offers the highest data transfer speeds and extremely low latency due to its very wide available bandwidth. However, these high-frequency waves have a limited range and are easily blocked by physical obstacles like buildings or trees. This band is best suited for dense urban environments requiring massive data throughput and connectivity.

32. (B) Multiplexer
A multiplexer is a digital logic circuit that accepts multiple data inputs and selects one of them to be forwarded to a single output line. This selection is governed by a set of control signals or select lines. Multiplexers are widely used in communication systems to share a single transmission medium among several different data sources very efficiently.

33. (B) Extended Producer Responsibility
Extended Producer Responsibility is a policy principle that assigns manufacturers the responsibility for the entire lifecycle of their products, particularly for collection and recycling at the end of their useful life. Under India's E-waste rules, this ensures that producers manage the environmental impact of electronic waste, encouraging more sustainable product designs and efficient waste management practices nationally.

34. (D) Digitally managed electricity transmission networks
A Smart Grid refers to an advanced electrical infrastructure that integrates modern digital communication and automation technologies into the power distribution network. This allows for real-time monitoring of electricity demand and supply, improves energy efficiency, and facilitates the integration of renewable energy sources. It enables two-way communication between utility providers and consumers to optimize the overall electricity grid operations.

35. (A) Both Statement I and Statement II are true
Smart meters are advanced electronic devices that facilitate two-way communication between the utility provider and the customer's premises. They provide real-time data on electricity consumption, which helps in accurate billing and load management. By automating the data collection process, these meters eliminate the need for manual readings and provide consumers with detailed insights into their specific energy usage.

36. (A) Henry
The Henry is the standard unit of measurement for electrical inductance in the International System of Units. It describes the property of a conductor by which a change in current through

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it induces an electromotive force. This unit is named after Joseph Henry, an American scientist who independently discovered electromagnetic induction alongside the famous physicist Michael Faraday during the nineteenth century.

37. (A) Physical sensing and actuation hardware
The hardware layer of an Internet of Things architecture comprises the physical components responsible for interacting with the environment, such as sensors and actuators. These devices collect data from the real world or perform physical actions based on received commands. This foundational layer provides the essential interface between the physical environment and the digital processing systems of the network.

38. (D) Transistor
The transistor is the fundamental building block of all modern integrated circuits. These miniature semiconductor devices function as electronic switches and amplifiers, allowing complex logical operations to be performed on a single silicon chip. By integrating millions or even billions of these tiny components, engineers can create high-performance microprocessors, memory modules, and other essential digital electronic systems used daily.

39. (D) Silicon
Silicon is the most widely used semiconductor material for manufacturing modern integrated circuits because of its excellent electrical properties and high abundance in nature. It can be easily processed to create transistors and other components with high precision. Furthermore, silicon's ability to form a high-quality insulating oxide layer makes it ideal for building complex, reliable microelectronic devices for consumers.

40. (D) Active and Passive
Radio Frequency Identification systems are categorized into active and passive types based on how they are powered. Active tags have their own internal power source, typically a battery, allowing them to transmit signals over longer distances. Passive tags, however, rely on energy harvested from the radio waves emitted by the RFID reader to power their internal circuitry and respond.

41. (B) Reader sends radio waves, Tag is powered by waves, Tag reflects back a signal with its data
When an RFID reader interacts with a passive tag, it first emits radio frequency waves into the surrounding environment. These waves are intercepted by the tag's antenna, which converts the electromagnetic energy into electrical power for its internal chip. Once activated, the tag modifies and reflects back a signal containing its unique identification data to the reader for processing.

42. (C) I, II, IV, and V only
The Production Linked Incentive scheme for large-scale electronics manufacturing in India is designed to boost domestic production by offering financial incentives based on incremental sales. Managed by the Ministry of Electronics and Information Technology, it targets mobile phones and specific electronic components rather than just televisions. This initiative aims to attract global investment and enhance India's electronic manufacturing capabilities.

43. (B) An AND gate yields high output for any high input
In digital electronics, the logic gates have specific operational rules. An OR gate provides a high output if any of its inputs are high, while a NOT gate simply inverts the input signal. However, an AND gate only produces a high output if all of its inputs are high. Therefore, claiming that an AND gate responds to any high input is incorrect.

44. (D) Netra
Netra is an Airborne Early Warning and Control system developed by India's Defence Research and Development Organisation. It consists of a suite of sensors and communication systems mounted on an aircraft to provide surveillance, tracking, and command capabilities over a wide area. This indigenous system is a critical asset for the Indian Air Force in maintaining security and airspace monitoring.

45. (C) Component manufacturing via gradual import duties
The Phased Manufacturing Programme is a strategic initiative under the Make in India project aimed at developing a robust domestic electronics ecosystem. It uses a gradual increase in import duties on various components to

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(B) P-2, Q-1, R-3, S-4
(C) P-3, Q-2, R-1, S-4
(D) P-1, Q-3, R-2, S-4

72. The following question consists of two statements—Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Analog to Digital Converters (ADCs) are essential for microprocessors to process physical world signals like temperature.
Reason (R): Microprocessors can only process discrete binary numbers, whereas physical world signals are continuous.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

73. In digital modulation, what does Quadrature Amplitude Modulation (QAM) alter to transmit data?
(A) Only the amplitude of the carrier wave
(B) Only the phase of the carrier wave
(C) Both the frequency and the phase of the carrier wave
(D) Both the amplitude and the phase of the carrier wave

74. A half adder circuit is constructed using which of the following logic gates?
(A) One AND gate and one OR gate
(B) Two NAND gates
(C) One XOR gate and one AND gate
(D) One XOR gate and one OR gate

75. Under India's electronics manufacturing push, what does EMC stand for?
(A) Electronic Mechanism Centers
(B) Electrical Machinery Corporations
(C) Electronic Module Circuits
(D) Electronics Manufacturing Clusters

76. Which of the following best describes the function of an Operational Amplifier (Op-Amp) in linear integrated circuits?
(A) Generation of high-frequency carrier wave signals
(B) Conversion of digital data into analog waveforms
(C) Storage of binary data within memory cells
(D) Analog-based mathematical signal processing

77. Which electronic component stores energy in a magnetic field when electric current flows through it?
(A) Resistor
(B) Capacitor
(C) Diode
(D) Inductor

78. The region in a p-n junction diode where there are no free charge carriers is called the:
(A) Inversion layer
(B) Conduction band
(C) Valence band
(D) Depletion region

79. Consider the following statements regarding Power Electronics:
I. It deals with the control and conversion of electrical power using solid-state devices.
II. Thyristors and IGBTs are commonly used devices in power electronics.
III. Power electronics circuits operate at very low currents and voltages exclusively.
Which of the above statement(s) is/are incorrect?
(A) I only
(B) III only
(C) II only
(D) I and II only

80. Consider the following statements about Analog to Digital Conversion (ADC):
I. The resolution of an ADC is determined by the number of bits.
II. A 8-bit ADC provides 256 distinct voltage levels.
III. Higher sampling rates decrease the accuracy of the digital signal.
IV. Aliasing occurs if the sampling rate is less than twice the maximum frequency.
V. Quantization is a lossless process.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) I, III, and V only
(C) II, IV, and V only
(D) I, II, and IV only

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and startups involved in the development of semiconductor designs. This initiative aims to reduce reliance on imported intellectual property and establish India as a global hub for semiconductor innovation.

55. (A) Resistor
A resistor is a passive electronic component designed to introduce a specific amount of electrical resistance into a circuit. Its primary role is to control the flow of current and create a voltage drop according to Ohm's Law. Resistors are essential for protecting sensitive components from excessive current and for establishing appropriate operating points in complex circuits.

56. (A) Bhopal
Bhopal serves as the location for India's pioneering e-waste clinic, which represents a major step in urban environmental management. The facility provides a centralized location where residents can safely deposit old electronics for responsible recycling. By handling toxic materials like lead and mercury professionally, the clinic helps prevent soil and water contamination, promoting a cleaner and more sustainable environment.

57. (A) Transistor
A transistor is classified as an active electronic component because it can control the flow of electrical power and provide signal gain. Unlike passive components such as resistors, capacitors, and inductors, which only consume or store energy, active components can amplify signals or act as electrically controlled switches. They are the fundamental building blocks of modern electronic amplification and digital processing.

58. (B) Sampling, Quantization, Encoding
The conversion of an analog signal to digital format involves three distinct stages. First, sampling takes periodic measurements of the signal's value over time. Next, quantization rounds these values to the nearest discrete level within a pre-defined range. Finally, encoding converts these quantized levels into binary code that can be processed by digital computers and other electronic communication systems.

59. (C) Phase Shift Keying (PSK)
Phase Shift Keying is a digital modulation technique where the phase of the carrier signal is shifted to represent different data values. By varying the timing of the wave's cycle, information can be encoded without changing the frequency or amplitude. This method is widely used in modern wireless communication systems, including Wi-Fi and satellite broadcasting, for efficient data transmission.

60. (B) Guarding circuits against spaceborne ionization
Radiation-hardened electronics are specially designed to withstand the harsh environment of outer space, where high-energy particles can damage standard circuits. These components utilize specialized materials and design techniques to prevent malfunctions caused by cosmic rays and solar radiation. For ISRO space payloads, such robustness is critical for ensuring the long-term reliability and success of various satellite missions.

61. (C) Phosphorus
To create an n-type semiconductor, silicon is doped with pentavalent impurities such as phosphorus. These atoms have five valence electrons, one more than the four found in silicon. This extra electron becomes a free charge carrier, increasing the material's conductivity by adding negative charge carriers. This process is essential for manufacturing diodes and transistors used in integrated circuits and chips.

62. (A) Surface Mount Technology (SMT)
Surface Mount Technology is a modern assembly method where electronic components are mounted directly onto the surface of printed circuit boards. This technique replaced the older through-hole method, allowing for much smaller component sizes and higher circuit density. It facilitates automated high-speed manufacturing, which is essential for producing contemporary compact electronic devices like smartphones and laptop computers.

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63. (A) General-purpose desktop computing usage
Microcontrollers are highly integrated chips containing a CPU, memory, and peripherals, specifically designed for embedded control in devices like microwave ovens or engine controllers. Unlike microprocessors used in desktop computers for a wide range of tasks, microcontrollers are optimized for low-power,

I. Hardware refers to the physical components of a computer system.
II. System software manages the hardware and provides a platform for application software.
III. A Local Area Network covers a larger geographic area than a Wide Area Network.
Which of the above statement(s) is/are correct?
(A) II and III only
(B) I and II only
(C) I and III only
(D) I, II and III

8. Arrange the following computer memory types in order of increasing access speed (slowest to fastest):
I. Cache Memory
II. Magnetic Disk
III. RAM (Main Memory)
IV. CPU Registers
Select the correct order:
(A) II, I, III, IV
(B) II, III, I, IV
(C) III, II, I, IV
(D) IV, I, III, II

9. Which component of ICT infrastructure is responsible for managing hardware resources and providing a common platform for other programs?
(A) Application Software
(B) System Software
(C) Middleware
(D) Firmware

10. Match the Information Systems in List-I with their functions in List-II:
List I: (Information System)
P. Transaction Processing System
Q. Management Information System
R. Decision Support System
S. Enterprise Resource Planning
List II: (Function)
1. Integrates core business processes across an organization
2. Helps senior management analyze complex, unstructured problems
3. Summarizes daily operational data for routine management reports
4. Records routine, day-to-day business events
(A) P-4, Q-3, R-2, S-1
(B) P-1, Q-2, R-3, S-4
(C) P-4, Q-2, R-3, S-1
(D) P-3, Q-4, R-1, S-2

11. How does a Decision Support System (DSS) fundamentally differ from a traditional MIS?
(A) DSS only produces routine scheduled reports
(B) DSS is primarily used for recording daily financial transactions
(C) DSS completely replaces human managers in the decision-making process
(D) DSS is designed to support complex, non-routine decision-making

12. Consider the following statements regarding the BharatNet project:
I. It is the world's largest rural broadband connectivity programme.
II. It aims to connect all Gram Panchayats in India.
III. It is implemented by Bharat Broadband Network Limited.
IV. It uses exclusively wireless technology for the middle mile connectivity.
V. It is funded by the Universal Service Obligation Fund.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV only
(B) II, III, IV and V only
(C) I, II, III and V only
(D) I, III, IV and V only

13. Which of the following best defines Information and Communication Technology (ICT)?
(A) The integration of telecommunications, computers, and software systems to process and transmit information
(B) The physical hardware components and mechanical devices used for data processing and storage
(C) The industrial process of manufacturing advanced computer processors and semiconductor microchips
(D) The exclusive implementation of artificial intelligence models for the automation of business tasks

14. Match the multimedia file formats in List-I with their types in List-II:
List I: (Multimedia File Format)
P. MP4

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these physical measurements into a digital format that the processor can interpret. The inability of microprocessors to directly process analog signals makes the ADC an essential interface component.

73. (D) Both the amplitude and the phase of the carrier wave
Quadrature Amplitude Modulation is a highly efficient digital modulation technique that transmits data by varying both the amplitude and the phase of the carrier wave. By combining these two characteristics, QAM can represent more bits per symbol compared to simpler methods. This technology is widely used in high-speed data communications, including cable internet, digital television, and modern wireless networks.

74. (C) One XOR gate and one AND gate
A half adder is a simple combinational circuit used to add two single-bit binary numbers. It consists of an XOR gate, which produces the sum bit, and an AND gate, which generates the carry bit. This basic structure allows for the fundamental operation of binary addition, though it cannot account for an incoming carry bit from a previous addition stage.

75. (D) Electronics Manufacturing Clusters
Electronics Manufacturing Clusters are designated geographic areas in India developed to provide world-class infrastructure and facilities for electronic component manufacturers. This scheme aims to create a robust supply chain and reduce logistical costs by grouping related industries together. By providing shared testing facilities and utilities, these clusters help attract global investments and boost the competitiveness of the Indian sector.

76. (D) Analog-based mathematical signal processing
An Operational Amplifier is a versatile high-gain electronic voltage amplifier used for various analog signal processing tasks. It is designed to perform mathematical operations such as addition, subtraction, integration, and differentiation by using external feedback components like resistors and capacitors. Op-Amps are fundamental components in linear integrated circuits, found in everything from audio mixers to complex electronic instrumentation systems.

77. (D) Inductor
An inductor is a passive electronic component consisting of a coil of wire that stores energy within a magnetic field when electric current passes through it. It opposes changes in the flow of current, making it useful for filtering signals and managing energy in power supplies. The amount of energy stored is proportional to the inductance and the current flow.

78. (D) Depletion region
The depletion region is a thin layer formed at the junction of p-type and n-type semiconductor materials where mobile charge carriers have diffused and neutralized each other. This region lacks free electrons and holes, creating an insulating barrier that prevents current flow under normal conditions. The width of this region can be controlled by applying external voltage to the diode.

79. (B) III only
Power electronics is a field focused on the control and conversion of electrical power using solid-state devices such as thyristors and IGBTs. It is widely used in applications ranging from small chargers to massive industrial motor drives and power grids. Therefore, the assertion that these circuits operate exclusively at very low currents and voltages is incorrect and factually false.

80. (D) I, II, and IV only
The resolution of an Analog to Digital Converter is defined by its bit count, with an 8-bit converter offering 256 distinct levels. Furthermore, aliasing is a significant error that occurs if the sampling rate falls below the Nyquist threshold. However, higher sampling rates generally improve signal accuracy rather than decreasing it, and quantization is inherently a lossy conversion process.

81. (C) Defence Electronics Research Laboratory (DLRL), Hyderabad
The Defence Electronics Research Laboratory, located in Hyderabad, is a specialized facility of DRDO dedicated to the development of Electronic Warfare systems. These systems include radar warning receivers, jammers, and signals intelligence equipment used to protect military assets and disrupt enemy communications. DLRL's work is critical for maintaining a

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advisories.
IV. Drone technology cannot be integrated with agricultural ICT systems.
V. Soil health cards use digital databases to track soil nutrient status.
Which of the above statement(s) is/are correct?
(A) I, II, III and IV only
(B) I, II, III and V only
(C) I, III, IV and V only
(D) II, III, IV and V only

23. Match the ICT initiatives in List-I with their targeted sectors in List-II:
List I: (ICT Initiative)
P. SWAYAM
Q. e-Sanjeevani
R. e-NAM
S. FASTag
List II: (Targeted Sector)
1. Healthcare
2. Transportation
3. Agriculture
4. Education
(A) P-4, Q-1, R-3, S-2
(B) P-4, Q-3, R-1, S-2
(C) P-1, Q-4, R-3, S-2
(D) P-3, Q-1, R-4, S-2

24. In computer networking, what is the primary function of a router?
(A) To convert digital signals to analog signals for transmission across telephone lines
(B) To store and cache frequent website data to allow for offline browsing access
(C) To protect local computer systems from various types of malware and network viruses
(D) To forward data packets between different computer networks to reach destinations

25. Arrange the following network types in increasing order of their geographical coverage area:
I. Wide Area Network
II. Personal Area Network
III. Metropolitan Area Network
IV. Local Area Network
Select the correct order:
(A) II, IV, I, III
(B) II, IV, III, I
(C) IV, II, III, I
(D) IV, III, II, I

26. Consider the following statements about Big Data characteristics:
I. Volume refers to the massive amount of data generated.
II. Velocity refers to the speed at which new data is generated and moves around.
III. Variety refers to the different types of data available.
IV. Veracity refers to the unchanging and static nature of historical data.
Which of the above statement(s) is/are incorrect?
(A) I only
(B) II and III only
(C) I, II and IV only
(D) IV only

27. Which of the following best describes batch processing in information systems?
(A) Accumulating transactions over time and processing them together in a group
(B) Processing data in continuous, uninterrupted, and high-speed digital streams
(C) Processing data immediately and automatically as it is entered into the system
(D) Processing data exclusively using distributed nodes across a global network

28. Match the Cloud Service Models in List-I with their examples in List-II:
List I: (Cloud Service Model)
P. IaaS
Q. PaaS
R. SaaS
S. DaaS
List II: (Example)
1. Google Workspace
2. Amazon Web Services (AWS) EC2
3. Google App Engine
4. Oracle Data Cloud
(A) P-2, Q-3, R-1, S-4
(B) P-1, Q-2, R-3, S-4
(C) P-3, Q-1, R-4, S-2
(D) P-2, Q-1, R-3, S-4

29. The development of ARPANET is considered a major milestone in the evolution of ICT. What was the primary purpose of ARPANET?
(A) To provide commercial internet to

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access to the essential data required for executing various computational and control tasks.

91. (B) OLEDs offer deeper blacks and higher contrast ratios
OLED displays provide significantly deeper blacks and higher contrast ratios compared to traditional LCDs because each pixel is its own light source. When a pixel needs to display black, it can be completely turned off, resulting in true black with zero light emission. This self-emissive property also allows for thinner screens and better energy efficiency when displaying dark content.

92. (C) Converting between serial and parallel data formats
A shift register is a sequential logic circuit used to store and move digital data in a specific direction. Its primary function is to convert data between serial and parallel formats, allowing data to be moved one bit at a time or several bits simultaneously. This versatility is essential for data communication interfaces and for managing temporary data storage within digital systems.

93. (D) Restriction of Hazardous Substances
The Restriction of Hazardous Substances directive is a global regulation that limits the use of specific toxic materials, such as lead, mercury, and cadmium, in the manufacturing of electronic and electrical equipment. Its goal is to protect human health and the environment from the harmful effects of electronic waste. Compliance with RoHS is mandatory for many products sold internationally today.

94. (C) Mission-specific scientific and electronic gear
In the context of space missions, the term payload refers to the specific equipment or instruments that a launch vehicle carries into space to perform a mission's objectives. This can include scientific sensors, communication transponders, cameras, or satellites. While the rocket provides the necessary propulsion, the payload is the essential electronic and mechanical gear designed to collect data or services.

95. (A) II, IV, III, I
Telecommunication technology in India has evolved through several distinct generations over the past decades. The journey began with the widespread deployment of 2G for basic voice and text, followed by 3G which introduced mobile data. 4G revolutionized internet speeds and enabled streaming services, while 5G is the most recent generation, offering ultra-high speeds and massive connectivity for modern systems.

96. (B) It stores a single bit of binary data
A flip-flop is a fundamental sequential logic circuit used in digital electronics to store a single bit of binary information. It has two stable states, typically representing a logic one or a logic zero, and can maintain its state as long as power is supplied. This ability to remember information makes flip-flops the essential building blocks for registers and memory.

97. (A) Chopper (DC-DC Converter)
In power electronics, a chopper is a static device that converts a fixed direct current voltage into a variable direct current voltage. It works by rapidly switching the input on and off, adjusting the average voltage delivered to the load. These DC-to-DC converters are widely used in electric vehicles and industrial motor control to efficiently manage power delivery and speed.

98. (B) Secure replacement of sensitive card data
Tokenization is a security process used in NFC-based electronic payments where sensitive credit card information is replaced with a unique, non-sensitive digital identifier called a token. This ensures that the actual card details are never transmitted during the transaction, significantly reducing the risk of data theft. If a token is intercepted, it is useless for making unauthorized electronic purchases.

99. (D) Free space (Radio waves)
Free space is an unguided transmission medium that allows for the wireless propagation of electromagnetic signals, such as radio waves and microwaves. Unlike guided media such as coaxial cables or optical fibers, which physically channel signals through a wire or glass, unguided media utilize the open air. This enables mobile communications, satellite links, and various wireless networking technologies used today.

100. (D) NOT Gate
A NOT gate is a basic digital logic gate that performs logical negation, meaning it reverses

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technological edge in the increasingly electronic-centric and modern digital battlefield.

82. (A) Controlled impurity addition to semiconductors
Doping is the process of intentionally introducing small amounts of specific impurities into a pure semiconductor material to alter its electrical properties. By adding elements like phosphorus or boron, engineers can increase the number of free electrons or holes, thereby creating n-type or p-type semiconductors. This controlled modification is the fundamental basis for manufacturing diodes, transistors, and modern integrated circuits.

83. (D) Chip transistor counts double every two years
Moore's Law is an observation made by Gordon Moore, stating that the number of transistors on a microchip doubles approximately every two years. This trend has historically driven the rapid advancement of computing power and the miniaturization of electronic devices. It has served as a benchmark for the electronics industry's progress in manufacturing technology and processor performance over several decades.

84. (C) Silicon
Silicon is a chemical element with properties intermediate between those of a conductor and an insulator, making it a classic semiconductor. Its ability to conduct electricity can be precisely controlled through temperature changes or the addition of impurities. Due to its abundance and excellent manufacturing characteristics, silicon is the primary material used for making integrated circuits and modern electronic components.

85. (C) Wide bandgap Silicon Carbide
Silicon Carbide is a wide bandgap semiconductor material that offers superior performance in high-power and high-frequency applications compared to standard silicon. Its wide bandgap allows it to operate at much higher temperatures and voltages without breaking down. This makes it ideal for use in electric vehicle power systems, high-speed rail, and advanced telecommunications equipment where high efficiency is critical.

86. (B) Signal clipping
Signal clipping occurs when an amplifier is driven beyond its maximum output capacity by an excessively large input signal. The tops and bottoms of the waveform are flattened because the amplifier cannot provide a voltage higher than its power supply limits. This distortion significantly alters the signal's shape and introduces unwanted noise and harmonics into the final amplified output signal.

87. (B) Electroluminescence
Light Emitting Diodes operate based on the phenomenon of electroluminescence, where light is emitted from a material when an electric current passes through it. In an LED, electrons recombine with holes at the p-n junction, releasing energy in the form of photons. The color of the light depends on the specific energy gap of the semiconductor material used.

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88. (B) P-1, Q-4, R-2, S-3
Different modulation techniques serve various communication needs. Amplitude Modulation is susceptible to noise but useful for long-distance radio, while Frequency Modulation offers high-fidelity audio. Pulse Code Modulation is a standard for digital telephony and audio, whereas Phase Shift Keying is widely used in wireless networks. Each method optimizes different aspects of signal transmission and data integrity for electronics.

89. (B) The number of cycles the processor executes per second
In the context of microprocessors, clock speed refers to the frequency at which the processor executes instructions, measured in cycles per second or Hertz. It determines how quickly the CPU can process data and perform logical operations. A higher clock speed generally indicates a faster processor, although other architectural factors also influence the overall performance of the computer system.

90. (A) Register
A register is a type of high-speed sequential logic circuit used in microprocessors to store multiple bits of binary data. It is composed of a group of flip-flops that can hold information such as data values, memory addresses, or instruction codes. Registers provide the processor with immediate

CHAPTER 16
Information and Communication Technology

1. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R).
Assertion (A): The digital divide in India refers strictly to the gap between rural and urban areas in terms of internet availability.
Reason (R): The digital divide encompasses disparities in access, affordability, and digital literacy across various demographic and socio-economic groups.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

2. Which among the following does not typically fall under the scope of ICT?
(A) Audiovisual processing systems
(B) Telecommunication networks
(C) Mechanical energy conversion systems
(D) Enterprise software applications

3. Consider the following statements regarding Cloud Computing service models:
I. Infrastructure as a Service provides virtualized computing resources over the internet.
II. Platform as a Service offers hardware and software tools primarily for application development.
III. Software as a Service delivers software applications over the internet on a subscription basis.
IV. Data as a Service provides data completely unmanaged and without security protocols.
Which of the above statement(s) is/are correct?
(A) I, II and IV only
(B) II, III and IV only
(C) I, II and III only
(D) I, III and IV only

4. Applying accumulated knowledge, experience, and deep understanding to solve complex, novel problems is represented by which level of the DIKW hierarchy?
(A) Data
(B) Information
(C) Wisdom
(D) Knowledge

5. Match the Digital India pillars in List-I with their descriptions in List-II:
List I: (Digital India Pillar)
P. Broadband Highways
Q. Universal Access to Mobile Connectivity
R. e-Kranti
S. Information for All
List II: (Description)
1. Electronic delivery of services
2. Providing network penetration to uncovered villages
3. High-speed internet network infrastructure
4. Open data platform and online hosting of information
(A) P-3, Q-2, R-1, S-4
(B) P-2, Q-3, R-4, S-1
(C) P-3, Q-1, R-2, S-4
(D) P-4, Q-2, R-1, S-3

6. Management Information Systems (MIS) primarily serve which level of management in an organization?
(A) Strategic level (Senior Management)
(B) Tactical level (Middle Management)
(C) Operational level (Supervisory Management)
(D) Manual workers

7. Consider the following statements regarding ICT Infrastructure:

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dedicated applications. Therefore, general-purpose desktop computing is not a typical feature or intended use for a standard microcontroller.

64. (C) I and III only
Modern consumer electronics are characterized by increasing integration with the Internet of Things and a continuous trend toward component miniaturization. These developments allow for smarter, more connected devices and more compact hardware. Meanwhile, demand for energy-efficient products continues to rise due to environmental concerns, and wearable technology has expanded far beyond the healthcare sector into fashion and fitness.

65. (A) Program Counter
The program counter is a vital register in a microprocessor that holds the memory address of the next instruction to be fetched and executed. As the processor completes each task, the program counter automatically increments to point to the following instruction in the sequence. This ensures that the CPU follows the correct logical flow of the programmed software instructions.

66. (A) Atomic Clock
NavIC satellites use highly precise atomic clocks to ensure accurate positioning and timing information. These clocks measure time based on the extremely stable vibration frequencies of atoms, such as rubidium or cesium. Since GPS and navigation systems rely on the precise measurement of signal travel time, the incredible accuracy of atomic clocks is essential for minimizing positioning and timing errors.

67. (C) DRDO
The Defence Research and Development Organisation is India's leading agency for the research and development of advanced military technologies. Within its various laboratories, DRDO develops sophisticated electronics including radars, electronic warfare systems, and communication equipment. These indigenous technologies are crucial for modernizing India's armed forces and achieving self-reliance in the strategic defense sector through advanced engineering and innovation.

68. (B) Filtering and pulsating DC smoothing
In a DC power supply circuit, the primary role of a capacitor is to filter out the fluctuations or ripples remaining after the rectification of alternating current. By storing charge when the voltage is high and releasing it when the voltage drops, the capacitor smooths the pulsating DC signal. This results in a stable and steady output voltage for components.

69. (A) Processing data locally near the source of generation
Edge computing in an IoT architecture involves processing data locally at the source where it is generated, such as on a sensor or a nearby gateway. This reduces the need to send massive amounts of raw data to a distant cloud server, thereby lowering latency and saving network bandwidth. It enables faster real-time decision-making for critical applications in automated systems.

70. (C) Voltage regulation
A Zener diode is a specialized type of diode designed to operate reliably in the reverse breakdown region. When the voltage across it reaches a specific threshold, called the Zener voltage, it allows current to flow in reverse while maintaining a constant voltage. This unique characteristic makes it an ideal component for voltage regulation and protection in various electronic circuits and supplies.

71. (A) P-3, Q-1, R-2, S-4
Electronic waste is categorized by the type of equipment it originates from. Large household appliances include items like refrigerators, while IT and telecommunications equipment covers devices like smartphones. Consumer equipment refers to items like televisions, and lighting equipment includes fluorescent lamps. Proper categorization is essential for effective recycling and management of toxic materials found in these various electronic waste products.

72. (A) Both A and R are true and R is the correct explanation of A.
Microprocessors are digital devices that only understand discrete binary signals, but most real-world phenomena like temperature or pressure are continuous analog signals. Analog to Digital Converters are therefore necessary to translate

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Q. JPEG
R. WAV
S. PDF
List II: (Type)
1. Image
2. Document
3. Audio
4. Video
(A) P-4, Q-1, R-3, S-2
(B) P-4, Q-2, R-3, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-1, Q-4, R-2, S-3

15. In a traditional Information System, what is the fundamental purpose of the feedback loop?
(A) To increase hardware processing speeds by optimizing the internal clock cycles
(B) To permanently delete all obsolete or redundant data from the primary database
(C) To automatically upgrade system software versions without requiring user intervention
(D) To return output to organization members to help evaluate or correct the input stage

16. Consider the following statements about the Digital India programme:
I. It aims to transform India into a digitally empowered society and knowledge economy.
II. Broadband Highways is one of its nine pillars.
III. It focuses exclusively on urban technological infrastructure.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

17. In the DIKW hierarchy, which term refers to data that has been processed, organized, or structured to provide meaning or context?
(A) Information
(B) Insight
(C) Knowledge
(D) Wisdom

18. The following question consists of two statements, one labeled as Assertion (A) and the other as Reason (R).
Assertion (A): Edge computing reduces latency compared to traditional cloud computing.
Reason (R): Edge computing brings computation and data storage closer to the location where it is needed.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

19. In the evolution of computing, the transition from vacuum tubes to transistors marked the beginning of which generation of computers?
(A) First Generation
(B) Second Generation
(C) Third Generation
(D) Fourth Generation

20. Select the correct logical sequence of stages in the data processing cycle.
(A) Collection, Input, Processing, Output, Storage
(B) Input, Collection, Storage, Processing, Output
(C) Processing, Input, Collection, Output, Storage
(D) Storage, Collection, Input, Processing, Output

21. A key characteristic of a Management Information System is that it relies predominantly on:
(A) External data sources such as social media trends and market rumors
(B) Artificial Intelligence to make completely independent business decisions
(C) Internal data generated by the organization's Transaction Processing Systems
(D) Real-time geographic positioning data for tracking logistics and fleets

22. Consider the following statements regarding ICT in agriculture:
I. Precision farming uses ICT to optimize returns on inputs while preserving resources.
II. e-NAM is a pan-India electronic trading portal for agricultural commodities.
III. Kisan Suvidha is an app providing farmers with weather, market prices, and agro-

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the logic state of its input signal. If the input is high, the output becomes low, and vice-versa. Because it effectively flips the binary value, it is commonly referred to as an inverter. This fundamental operation is used throughout digital systems for signal conditioning.

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households
(B) To act as a centralized database for international financial transactions
(C) To facilitate military and academic resource sharing across vast distances
(D) To serve as the first cloud computing platform for public use

30. Which of the following represents the correct order of the Data, Information, Knowledge, and Wisdom (DIKW) hierarchy from base to apex?
(A) Information, Data, Knowledge, Wisdom
(B) Data, Knowledge, Information, Wisdom
(C) Knowledge, Data, Information, Wisdom
(D) Data, Information, Knowledge, Wisdom

31. Which of the following is an indigenous GIS application platform developed by the Indian Space Research Organisation (ISRO)?
(A) Google Earth
(B) ArcGIS
(C) Bhuvan
(D) QGIS

32. The Indian National Centre for Ocean Information Services (INCOIS) uses advanced ICT systems primarily to issue early warnings for which specific disaster?
(A) Earthquakes
(B) Tsunamis
(C) Forest Fires
(D) Droughts

33. Which of the following is considered a major challenge when an organization implements an ERP system?
(A) Decreased visibility into local inventory levels
(B) High costs and complex business process reengineering
(C) Disconnection of different vital business departments
(D) Inability to handle standard financial transactions

34. In the context of ICT accessibility, what does Assistive Technology primarily refer to?
(A) Software used by customer care executives to resolve user complaints
(B) Robotic machinery used in automated high-tech manufacturing plants
(C) Cloud servers that provide secondary backup for organizational data
(D) Tools and software designed to help people with disabilities use computers

35. The concept of Precision Farming relies heavily on ICT. Which technology is most crucial for mapping field variability in precision farming?
(A) Global Positioning Systems (GPS)
(B) Blockchain
(C) Quantum Computing
(D) Virtual Reality

36. DigiLocker, a key initiative under Digital India, serves what primary purpose?
(A) Providing a secure cloud platform for storage and verification of documents
(B) Providing safe online transactions for modern mobile e-commerce platforms
(C) Providing a way of locking stolen mobile devices remotely via the internet
(D) Providing encryption for classified government communications and emails

37. Which of the following is a vital component of a Decision Support System that allows users to analyze data using what-if scenarios?
(A) Model Base
(B) Transaction Database
(C) Optical Character Recognition
(D) Router Configuration

38. FASTag, mandatory for toll collection in India, uses which ICT technology for making toll payments directly from a prepaid or savings account linked to it?
(A) Near Field Communication (NFC)
(B) Bluetooth Low Energy (BLE)
(C) Wi-Fi Direct
(D) Radio Frequency Identification (RFID)

NODIA

39. The term Digital Divide is best described as the gap between:
(A) Older desktop computer models and modern high-performance smartphones
(B) Professional hardware engineers and specialized software developers
(C) Proprietary software license users and open-source software community users
(D) Individuals with access to modern information technology and those without

central processing unit, memory, and peripheral devices. By providing a stable platform and essential utilities, it allows application software to run efficiently without requiring programmers to write code specifically for every individual hardware component.

10. (A) P-4, Q-3, R-2, S-1
Transaction Processing Systems record daily business events like sales and receipts. Management Information Systems summarize this data for routine reports. Decision Support Systems assist senior management with unstructured problems through analytical modeling. Enterprise Resource Planning systems integrate various core business processes, such as finance and human resources, into a single, unified system for organization-wide coordination.

11. (D) DSS is designed to support complex, non-routine decision-making
While a traditional Management Information System focuses on providing structured, routine reports based on internal data, a Decision Support System is tailored for semi-structured or unstructured problems. It utilizes interactive models and data analysis tools to help managers explore different scenarios. This makes it essential for addressing unique, non-routine situations that require human judgment and simulation.

12. (C) I, II, III and V only
BharatNet is a massive initiative funded by the Universal Service Obligation Fund to provide broadband connectivity to all Gram Panchayats. It is implemented by Bharat Broadband Network Limited. While the project primarily utilizes high-speed optical fiber for its infrastructure, it does not rely exclusively on wireless technology, which is often used only for last-mile connectivity.

13. (A) The integration of telecommunications, computers, and software systems to process and transmit information
Information and Communication Technology refers to the convergence of computing, telecommunications, and media technologies. It involves the use of hardware and software to create, store, exchange, and process information in various forms. This integration allows for seamless communication and data management across global networks, extending beyond simple mechanical devices or specific manufacturing processes for semiconductor chips.

14. (A) P-4, Q-1, R-3, S-2
MP4 is a widely used digital multimedia container format primarily for storing video and audio. JPEG is the standard format for compressed photographic images. WAV is an audio file format used for storing uncompressed sound data on computers. PDF is a versatile document format designed to present documents consistently across different software, hardware, and various operating systems.

15. (D) To return output to organization members to help evaluate or correct the input stage
In an information system, the feedback loop serves as a critical control mechanism. It involves monitoring the system's output and returning that information to relevant personnel or automated controllers. This process allows the organization to evaluate performance against objectives, identify errors in the input or processing stages, and make necessary adjustments to ensure the system functions correctly.

16. (A) I and II only
The Digital India programme is a flagship initiative designed to transform the nation into a digitally empowered society. It consists of nine pillars, including Broadband Highways, which aim to provide universal internet access. Contrary to focusing exclusively on urban areas, the programme emphasizes rural connectivity and digital literacy to ensure that technological benefits reach every citizen across the country.

17. (A) Information
Within the DIKW hierarchy, information represents data that has been processed and organized to provide meaningful context. While data consists of raw facts and figures, information answers questions like who, what, where, and when. This contextualized data becomes useful for decision-making because it clarifies relationships and patterns that are not immediately apparent in its raw, unorganized form.

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50. Which ICT innovation uses a unified interface to facilitate inter-bank peer-to-peer and person-to-merchant transactions in India?
(A) SWIFT
(B) Core Banking Solution (CBS)
(C) Unified Payments Interface (UPI)
(D) Immediate Payment Service (IMPS)

51. The Digital India programme centers on three key vision areas. Which of the following is not one of them?
(A) Digital infrastructure as a utility to every citizen
(B) Governance and services on demand
(C) Digital empowerment of citizens
(D) Establishing overseas technology colonies

52. Geographic Information Systems (GIS) are primarily used to capture, store, manipulate, analyze, manage, and present which type of data?
(A) Financial accounting data
(B) Biometric security data
(C) Textual historical records
(D) Spatial or geographic data

53. Electronic Health Records (EHR) offer several advantages over traditional paper records. Which of the following is an exception to these advantages?
(A) Improved legibility of medical history
(B) Immediate access to patient records across different facilities
(C) Complete immunity from unauthorized access and data breaches
(D) Better coordination among healthcare providers

54. Which of the following is not typically considered a primary cause of the digital divide in India?
(A) High cost of internet-enabled devices
(B) Lack of digital literacy skills
(C) Wide availability of high-speed broadband in rural villages
(D) Lack of regional language digital content

55. ICT plays a critical role in logistics and fleet management. Which technology is used to monitor the real-time location and speed of commercial vehicles?
(A) Telematics
(B) Biometrics
(C) Cryptography
(D) Photogrammetry

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56. An ATM system processing bank withdrawals is a classic example of which type of information system?
(A) Transaction Processing System
(B) Decision Support System
(C) Expert System
(D) Executive Information System

57. The National Digital Communications Policy (NDCP) 2018 of India aimed to provide universal broadband connectivity at what speed to every citizen?
(A) 10 Mbps
(B) 50 Mbps
(C) 100 Mbps
(D) 1 Gbps

58. eSanjeevani, a flagship initiative under the Ayushman Bharat Digital Mission, is primarily associated with:
(A) Telemedicine and online OPD services
(B) Electronic medical billing and insurance
(C) Distribution of free pharmaceutical medicines
(D) Tracking vaccine shipments and cold chains

59. What is the function of a Content Delivery Network (CDN) in modern digital media?
(A) To create computer-generated imagery for high-budget Hollywood movies
(B) To regulate media censorship automatically using AI algorithms
(C) To deliver internet content quickly using geographically distributed servers
(D) To convert text into digital audio files for accessibility purposes

60. The integration of ICT in the Indian banking sector gave rise to NEFT and RTGS. What is the fundamental difference between them?
(A) NEFT is for international transfers while RTGS is for domestic transfers only
(B) NEFT operates in batches while RTGS settles transactions continuously in real-time
(C) NEFT requires internet banking while

Which of the following is correct?

(A) Both Statement I and Statement II are correct

(B) Both Statement I and Statement II are incorrect

(C) Statement I is correct and Statement II is incorrect

(D) Statement I is incorrect and Statement II is correct

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(A) Wisdom is the lowest and most basic tier of the hierarchy.
(B) Data consists of discrete, objective facts without context.
(C) Information is data that has been organized to have meaning.
(D) Knowledge involves synthesizing information and applying experience.

72. In global ICT assessment, what does Teledensity specifically measure?
(A) The total physical weight of telecommunication cables installed in a country
(B) The number of telephone connections for every hundred individuals in an area
(C) The speed of the average broadband connection in metropolitan urban centers
(D) The ratio of modern smartphones compared to traditional analog landlines

73. Big Data is often characterized by the Vs. Which V refers to the unreliability or inconsistency of data sources?
(A) Volume
(B) Velocity
(C) Variety
(D) Veracity

74. Which multimedia format is a vector graphics standard primarily maintained by the World Wide Web Consortium (W3C)?
(A) BMP
(B) GIF
(C) SVG
(D) TIFF

75. Under the PMGDISHA scheme, which target group is eligible for digital literacy training?
(A) Only urban college students
(B) Exclusively government employees
(C) IT professionals seeking advanced certification
(D) One person from every eligible rural household

76. Common Service Centres (CSCs) are a strategic component of the National e-Governance Plan. What is their primary role?
(A) To act as centralized data storage facilities for various central government departments
(B) To train urban youth in advanced software coding and professional database management
(C) To monitor cybercrimes and network security threats at the local district administrative level
(D) To serve as front-end delivery points for public, private, and social services to rural citizens

77. What is the primary operational difference between Edge Computing and traditional Cloud Computing?
(A) Edge computing processes data on a centralized remote server
(B) Edge computing requires massive underground server farms
(C) Edge computing relies strictly on wired connections, whereas cloud relies on wireless
(D) Edge computing processes data near the network's periphery where the data is generated

78. The International Telecommunication Union (ITU) is a specialized agency of the United Nations responsible for matters related to information and communication technologies. Where are its headquarters located?
(A) New York, USA
(B) Vienna, Austria
(C) Paris, France
(D) Geneva, Switzerland

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79. Business Intelligence (BI) technologies are primarily designed to achieve which of the following?
(A) To automatically generate raw data from social media and digital sensor networks
(B) To support better business decision-making by analyzing historical and current data
(C) To design hardware architecture for high-performance servers and network switches
(D) To replace human resources departments completely with automated software bots

80. The JPEG format for images typically uses which type of compression?
(A) Lossless compression
(B) Executable compression
(C) Archive compression

RTGS requires a branch visit
(D) NEFT deals with mutual funds while RTGS is exclusively for stock trading

61. What was the overarching goal of the World Summit on the Information Society (WSIS)?
(A) To establish a single global currency for all international digital transactions
(B) To ban the use of military artificial intelligence across all sovereign nations
(C) To bridge the global digital divide and build a people-centered information society
(D) To privatize all global satellite networks for commercial telecommunication use

62. Which open-source software framework is widely used for distributed storage and processing of large datasets using the MapReduce programming model?
(A) Hadoop
(B) Linux
(C) Android
(D) WordPress

63. The individual who manages and operates a Common Service Centre at the village level is officially known as a:
(A) Village Level Entrepreneur (VLE)
(B) Gram Panchayat Adhikari
(C) Digital Sevak
(D) Cyber Administrator

64. Fog Computing, a term coined by Cisco, acts as an intermediary layer between which two components?
(A) The operating system and application software
(B) Local area networks and wide area networks
(C) Cloud computing data centers and edge devices
(D) The CPU and RAM

65. Multimedia is an integration of multiple forms of media. Which of the following elements is generally not considered a standard multimedia element?
(A) Mechanical energy
(B) Animation
(C) Text
(D) Audio

66. Which organization acts as the central implementing agency for the Pradhan Mantri Gramin Digital Saksharta Abhiyaan (PMGDISHA)?
(A) CSC e-Governance Services India Limited
(B) ISRO
(C) NITI Aayog
(D) National Informatics Centre (NIC)

67. The implementation of the BharatNet project is funded predominantly by which entity?
(A) World Bank
(B) International Monetary Fund (IMF)
(C) Universal Service Obligation Fund (USOF)
(D) Reserve Bank of India

68. Which of the following best defines Cloud Computing?
(A) A specific meteorological technology used to predict local regional weather patterns
(B) The delivery of computing services such as servers and storage over the Internet
(C) Computing restricted entirely to an organization's local, physical, on-site servers
(D) The use of quantum bits to solve complex mathematical problems and encryption

69. The United Nations Sustainable Development Goals (SDGs) recognize ICT as a crucial enabler. Which specific SDG explicitly mentions the need to significantly increase access to information and communications technology?
(A) SDG 2 (Zero Hunger)
(B) SDG 6 (Clean Water and Sanitation)
(C) SDG 9 (Industry, Innovation and Infrastructure)
(D) SDG 14 (Life Below Water)

70. Which of the following is a primary function of the International Telecommunication Union (ITU)?
(A) Manufacturing fiber optic cables
(B) Issuing domain names for commercial websites
(C) Allocating global radio spectrum and satellite orbits
(D) Prosecuting international cybercriminals

71. Regarding the hierarchy of Data, Information, Knowledge, and Wisdom, identify the incorrect statement:

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Management
(C) Network for Disaster Event Mapping
(D) Nodal Department of Environmental Management

92. Which of the following best exemplifies the Cause and Effect relationship in ICT?
Cause: Implementation of an Enterprise Resource Planning (ERP) system across all state departments.
Effect:
(A) Reduction in broadband speeds across the state network infrastructure
(B) Disintegration of departmental communication and data silos
(C) Streamlined workflow, reduced redundancy, and integrated data sharing
(D) Increase in manual, paper-based data entry for all local administrators

93. In Madhya Pradesh, the CM Helpline 181 is an example of ICT applied in which domain?
(A) Precision Agriculture
(B) Satellite Navigation
(C) Digital Currency
(D) E-Governance and Grievance Redressal

94. State Data Centres (SDCs) form a core infrastructure component under the National e-Governance Plan (NeGP). What is their key function?
(A) To provide physical security protocols and surveillance to important government buildings
(B) To distribute high-speed broadband routers and modem devices to individual households
(C) To act as a centralized reservoir of data, applications, and services at the state level
(D) To manage international diplomatic communications and secure encrypted data transmission

95. Which of the following statements about Data Analytics is most appropriate?
(A) It is the process of examining datasets to draw conclusions about the information
(B) It refers exclusively to the physical storage of data on traditional local hard drives
(C) It is the specialized method of manufacturing microprocessors for modern data centers
(D) It restricts users from making predictions based on available historical data points

96. MPOnline is the official portal of the Madhya Pradesh Government for delivering citizen services. Which specific ICT model does it represent?
(A) Business to Business (B2B)
(B) Government to Citizen (G2C)
(C) Citizen to Citizen (C2C)
(D) Government to Government (G2G)

97. Which one of the following is an incorrect statement regarding Geographic Information Systems (GIS)?
(A) GIS cannot be used for urban planning.
(B) GIS integrates spatial and attribute data.
(C) GIS helps in visualizing geographic data on maps.
(D) GIS is used in tracking and managing natural resources.

NODIA

98. Which of the following serves as the major constraint or exception when implementing ICT in rural areas of Madhya Pradesh?
(A) Availability of free government software
(B) Uninterrupted power supply and high-speed internet availability
(C) Overabundance of highly skilled IT engineers locally
(D) Lack of geographic space for common service centres

99. Identify the correct pair among the following ICT concepts and their definitions:
(A) Telemedicine: Use of satellite imaging for crop mapping
(B) E-NAM: Portal for managing electronic hospital records
(C) E-learning: Management of electronic banking transactions
(D) E-commerce: Buying and selling of goods over electronic networks

100. Consider the following statements:
Statement I: The Digital India initiative aims to empower citizens digitally but ignores cybersecurity frameworks.
Statement II: E-Kranti is an essential pillar of Digital India that focuses on electronic delivery of services.

40. What is the primary purpose of the SWAYAM platform launched by the Ministry of Education?
(A) To provide free cloud storage for university students
(B) To process scholarship applications
(C) To conduct online civil service examinations
(D) To offer Massive Open Online Courses (MOOCs)

41. What is the fundamental objective of the BharatNet project?
(A) To provide free mobile phones to the urban poor and unemployed citizens
(B) To connect all Gram Panchayats in India with high-speed optical fibre networks
(C) To launch a state-owned social media platform for government announcements
(D) To lay undersea cables connecting India to Europe and North American hubs

42. Transaction Processing Systems must possess the ACID properties to ensure data integrity. In this context, what does the A stand for?
(A) Accessibility
(B) Authentication
(C) Atomicity
(D) Automation

43. How does ICT assist in the Preparedness phase of disaster management?
(A) By organizing post-disaster rehabilitation camps
(B) By developing early warning systems and simulating disaster scenarios
(C) By providing financial compensation through direct benefit transfers
(D) By rebuilding damaged physical infrastructure

44. The e-NAM portal launched by the Government of India aims to create a unified national market for which of the following?
(A) Electronic goods
(B) Traditional handicrafts
(C) Pharmaceutical products
(D) Agricultural commodities

45. According to India's National Policy on Information Technology, which of the following is a primary objective?
(A) Banning the import of all foreign electronic devices
(B) Replacing all educational institutions with entirely virtual schools
(C) Promoting India as a global hub for IT/ITeS and electronics manufacturing
(D) Eliminating private sector participation in the IT industry

46. What is the primary objective of implementing an Enterprise Resource Planning (ERP) system in a business?
(A) To manage customer social media interactions and brand reputation across multiple web platforms
(B) To integrate internal and external management information across an entire organization
(C) To automate individual computer workstations and peripheral devices for administrative staff
(D) To design marketing graphics and promotional materials for various digital advertising campaigns

47. Which Government of India initiative specifically aims to provide digital literacy to six crore rural households?
(A) Make in India
(B) PMGDISHA
(C) Start-up India
(D) Ayushman Bharat

48. DIKSHA, an initiative of the Government of India, is related to which of the following fields?
(A) Digital Healthcare
(B) School Education and Teachers' Training
(C) Agricultural Subsidies
(D) Direct Benefit Transfer

49. The transition from traditional broadcasting to Over-The-Top (OTT) platforms represents a major ICT shift in media. What characterizes an OTT service?
(A) Content delivered directly over the internet bypassing traditional providers
(B) Content delivered exclusively via home-based satellite dishes and receivers
(C) Content broadcast using analog radio frequencies to local metropolitan areas
(D) Content distributed purely through physical storage media like DVDs or Blu-ray

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ANSWERS

1. (D) A is false but R is true.
The digital divide represents a multifaceted gap involving access to technology and the skills to use it effectively. While geographic location is a factor, it also includes socio-economic status, age, and gender. Restricting the definition only to rural-urban internet availability is inaccurate, as it overlooks deeper systemic disparities in affordability and literacy.

2. (C) Mechanical energy conversion systems
Information and Communication Technology encompasses technologies that facilitate the storage, transmission, and processing of data. This includes telecommunications, software, and audiovisual systems. Mechanical energy conversion systems belong to the field of physics or mechanical engineering, focusing on power generation and movement rather than digital information management or communication networks.

3. (C) I, II and III only
Infrastructure as a Service provides virtualized hardware resources, while Platform as a Service offers development tools for building applications. Software as a Service delivers ready-to-use applications via the internet. Data as a Service must include managed security protocols and structured delivery to be effective, making the claim about unmanaged data without security protocols incorrect.

4. (C) Wisdom
Wisdom represents the pinnacle of the hierarchy, characterized by the ability to apply deep understanding and experience to solve novel problems. It goes beyond possessing information or knowledge by incorporating judgment and ethical considerations. While knowledge involves understanding patterns, wisdom provides the foresight and discernment necessary for making complex, value-based decisions in real-world scenarios.

5. (A) P-3, Q-2, R-1, S-4
Broadband Highways focus on building high-speed network infrastructure across the country. Universal Access to Mobile Connectivity targets network penetration in previously uncovered villages. e-Kranti emphasizes the electronic delivery of government services to improve efficiency and transparency. Information for All provides open data platforms and online hosting of information to ensure public access to data.

6. (B) Tactical level (Middle Management)
Management Information Systems are designed to support middle-level managers at the tactical level. These systems transform raw data from operational transactions into summarized reports and exception logs. This enables managers to monitor performance, make routine decisions, and plan for the near future, filling the gap between daily operations and high-level strategic planning.

7. (B) I and II only
Hardware encompasses the tangible physical components like processors and memory, while system software, such as operating systems, coordinates these components and supports applications. However, a Local Area Network typically covers a small geographic area, such as a single building. In contrast, a Wide Area Network spans much larger regions, including cities, countries, or continents.

8. (B) II, III, I, IV
Access speed in computer memory is determined by physical proximity to the processor and the technology used. Magnetic disks are the slowest as they rely on mechanical movement. RAM is faster but volatile. Cache memory provides higher speeds by storing frequently used data near the CPU. CPU registers are the fastest, located directly within the processor.

9. (B) System Software
System software acts as the intermediary between hardware and user applications. Its primary role is to manage hardware resources like the

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(D) Lossy compression

81. Identify the odd one out among the following mobile communication generations:
(A) 2G
(B) 3G
(C) 4G
(D) Wi-Fi

82. The World Summit on the Information Society (WSIS) was a two-phase United Nations-sponsored summit. In which cities did the two phases take place?
(A) Geneva and Tunis
(B) New York and London
(C) Paris and Tokyo
(D) New Delhi and Beijing

83. Which international organization is recognized globally for developing and publishing standards such as the OSI model for telecommunications and computing?
(A) UNESCO
(B) WTO
(C) WHO
(D) ISO (International Organization for Standardization)

84. How does ICT directly contribute to SDG 4 (Quality Education)?
(A) By replacing all human teachers with automated robotic instructors and software
(B) By standardizing school uniforms globally through international digital databases
(C) By facilitating e-learning, distance education, and access to digital resources
(D) By eliminating the need for physical schools through virtual reality environments

85. In cloud computing deployment models, a cloud infrastructure provisioned for exclusive use by a single organization comprising multiple consumers is known as a:
(A) Public Cloud
(B) Community Cloud
(C) Private Cloud
(D) Hybrid Cloud

86. The Network Readiness Index (NRI) is a global indicator of ICT development. Which organization originally launched this index?
(A) United Nations Development Programme (UNDP)
(B) World Economic Forum (WEF)
(C) International Telecommunication Union (ITU)
(D) World Bank

87. Edge computing is highly beneficial for Internet of Things (IoT) devices primarily because it:
(A) Increases data transmission latency
(B) Reduces latency and bandwidth usage by analyzing data locally
(C) Prevents the devices from connecting to the internet entirely
(D) Requires less physical hardware in the devices

88. In ICT standards, what does the principle of Interoperability mean?
(A) The ability of a system to run exclusively on expensive proprietary hardware
(B) The ability of computer systems or software to exchange and make use of information
(C) The process of completely shutting down a network during a critical cyber attack
(D) The physical connection of computers using identical cables and connectors

89. Predictive Analytics relies heavily on statistical algorithms and machine learning to:
(A) Summarize what has happened in the past using simple descriptive data charts
(B) Identify the likelihood of future outcomes based on historical data patterns
(C) Delete redundant databases and clear up storage space on local computer drives
(D) Encrypt real-time communications to ensure privacy between different users

90. Which data compression technique reduces file size without losing any of the original data?
(A) Lossless compression
(B) Lossy compression
(C) Fractal compression
(D) Destructive compression

NODIA

91. In the context of disaster management in India, the NDEM portal stands for:
(A) National Disaster and Emergency Machinery
(B) National Database for Emergency

18. (A) Both A and R are true and R is the correct explanation of A.
Edge computing significantly reduces latency by processing data at the network's periphery, closer to the source of generation. By minimizing the distance data must travel to a centralized cloud server, response times are improved for time-sensitive applications. This decentralized approach optimizes bandwidth and enhances performance for real-time tasks, making the proximity of storage and computation highly effective.

19. (B) Second Generation
The second generation of computers was defined by the replacement of bulky, heat-producing vacuum tubes with smaller, more efficient transistors. This shift led to a significant reduction in computer size, power consumption, and cost while increasing speed and reliability. Transistors allowed for the development of more complex circuitry, paving the way for advanced programming languages and improved memory storage.

20. (A) Collection, Input, Processing, Output, Storage
The data processing cycle begins with the collection of raw facts from various sources. This data is then converted into a machine-readable format during the input stage. Next, the computer performs operations on the data during processing to produce meaningful information. This information is presented as output and finally kept in storage for future use or reference.

21. (C) Internal data generated by the organization's Transaction Processing Systems
A Management Information System primarily relies on internal data captured by Transaction Processing Systems during routine business operations. By aggregating and summarizing data from sales, inventory, and accounting, the system provides managers with a clear view of organizational performance. While external data can be useful, the core function of an MIS is to support internal tactical planning and control.

22. (B) I, II, III and V only
Precision farming, e-NAM, Kisan Suvidha, and soil health cards are all examples of ICT applications that enhance agricultural productivity and market access. These technologies provide farmers with critical data on soil, weather, and prices. The assertion that drone technology cannot be integrated is false, as drones are increasingly used for crop monitoring, pesticide spraying, and mapping in modern agriculture.

23. (A) P-4, Q-1, R-3, S-2
SWAYAM is an educational platform offering online courses. e-Sanjeevani provides telemedicine services for healthcare. e-NAM is a digital trading portal for agricultural commodities. FASTag facilitates electronic toll collection for transportation. Each of these initiatives leverages ICT to improve efficiency and accessibility within their respective sectors, contributing to the broader goal of a digitally empowered nation and society.

24. (D) To forward data packets between different computer networks to reach destinations
A router acts as a critical networking device that directs data traffic between different networks. It uses routing tables and protocols to determine the most efficient path for data packets to reach their intended destination. By connecting various networks, such as a home network to the internet, routers ensure that information is transmitted accurately and quickly across complex digital infrastructures.

25. (B) II, IV, III, I
Personal Area Networks cover the smallest range, typically around an individual. Local Area Networks span limited areas like offices or homes. Metropolitan Area Networks connect users within a city-wide geographic area. Wide Area Networks have the largest coverage, spanning countries or continents. This progression from smallest to largest geographical footprint is the standard classification for different types of computer networks.

26. (D) IV only
Big Data is defined by the four Vs: Volume, Velocity, Variety, and Veracity. Veracity specifically refers to the quality, accuracy, and trustworthiness of the data, rather than its static nature. In fact, Big Data is often highly dynamic and constantly changing. The other three characteristics correctly describe the massive

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emergency operations, and coordinate relief efforts more effectively during natural or man-made disasters across the country.

92. (C) Streamlined workflow, reduced redundancy, and integrated data sharing
The implementation of an Enterprise Resource Planning system acts as a major catalyst for organizational transformation. By integrating data and processes across different departments, the system eliminates communication silos and reduces redundant data entry. This leads to a more streamlined workflow where information is shared seamlessly, improving overall operational efficiency. The unified view provided by the ERP system also enhances management's ability to make informed decisions and optimize resource allocation.

93. (D) E-Governance and Grievance Redressal
The CM Helpline 181 in Madhya Pradesh is a prominent example of ICT used for e-governance and grievance redressal. This platform allows citizens to report their problems and complaints directly to the government through a toll-free number. The system tracks the status of each grievance and ensures that it is addressed by the relevant department in a timely manner. This digital initiative enhances accountability and improves the efficiency of public service delivery.

94. (C) To act as a centralized reservoir of data, applications, and services at the state level
State Data Centres are key infrastructure components under the National e-Governance Plan designed to consolidate data and applications at the state level. They provide a secure and reliable environment for hosting various government websites and services. By centralizing these resources, SDCs improve the efficiency of e-governance initiatives and ensure that data is managed securely. This infrastructure is essential for providing seamless and integrated services to citizens and government departments.

95. (A) It is the process of examining datasets to draw conclusions about the information
Data analytics is the science of analyzing raw data to uncover patterns, trends, and insights. By using various statistical and mathematical techniques, analysts can draw meaningful conclusions that help organizations make better decisions. This process is used across many fields, from business and finance to healthcare and social sciences. Data analytics is not just about storage; it involves the active examination and interpretation of data to drive innovation and efficiency.

96. (B) Government to Citizen (G2C)
MPOnline is a comprehensive portal of the Madhya Pradesh government that provides a wide range of services to citizens, such as applying for certificates, paying bills, and registering for exams. This platform represents the Government to Citizen (G2C) model of e-governance, which focuses on improving the interaction between the government and its people. By offering services online, MPOnline makes it easier for citizens to access government resources without having to visit offices.

NODIA

97. (A) GIS cannot be used for urban planning.
Geographic Information Systems are actually powerful tools that are extensively used in urban planning. GIS allows planners to analyze spatial data related to land use, transportation, and infrastructure to make informed decisions about city development. By visualizing and modeling different scenarios, GIS helps in optimizing resource allocation and addressing urban challenges like congestion and environmental impact. The statement that GIS cannot be used for urban planning is therefore completely incorrect.

98. (B) Uninterrupted power supply and high-speed internet availability
Implementing ICT in rural areas of Madhya Pradesh faces significant challenges, primarily related to the lack of reliable infrastructure. The absence of an uninterrupted power supply and high-speed internet connectivity prevents many rural communities from fully utilizing digital services. While government software may be available, it cannot function effectively without these basic utilities. Addressing these infrastructural gaps is essential for bridging the digital divide and ensuring that rural citizens can benefit from technology.

99. (D) E-commerce: Buying and selling of goods over electronic networks
E-commerce refers to the business activity of buying and selling products and services over electronic networks, most commonly the internet.

35. (A) Global Positioning Systems (GPS)
Global Positioning Systems are essential for precision farming as they allow farmers to accurately map their fields and track the location of equipment. By providing precise spatial data, GPS enables the variable-rate application of seeds, fertilizers, and pesticides based on the specific needs of different areas. This targeted approach improves resource efficiency, reduces environmental impact, and maximizes overall crop yields.

36. (A) Providing a secure cloud platform for storage and verification of documents
DigiLocker is a key initiative under the Digital India programme that provides citizens with a secure, personal cloud-based storage space. It allows users to store and access digital versions of essential documents like driving licenses, mark sheets, and identity cards. These digital documents are legally recognized and can be electronically verified, eliminating the need for carrying physical copies.

37. (A) Model Base
The model base is a fundamental component of a Decision Support System that contains various mathematical and analytical models. These models allow users to perform complex data analysis, including what-if scenarios and simulations. By manipulating different variables, managers can predict potential outcomes and evaluate the impact of various decisions, making it an indispensable tool for solving semi-structured and unstructured problems.

38. (D) Radio Frequency Identification (RFID)
FASTag utilizes Radio Frequency Identification technology to enable contactless toll payments. An RFID tag attached to the vehicle's windshield is scanned by sensors at toll plazas as the vehicle passes. The toll amount is then automatically deducted from the linked prepaid or savings account. This system reduces congestion at toll booths, saves time for commuters, and promotes cashless transactions.

39. (D) Individuals with access to modern information technology and those without
The digital divide refers to the significant gap between different segments of society regarding their access to and use of modern information and communication technologies. This disparity is influenced by various factors, including income levels, education, geographic location, and age. Bridging this divide is crucial for ensuring equitable access to information, educational resources, economic opportunities, and essential government services.

40. (D) To offer Massive Open Online Courses (MOOCs)
SWAYAM is a flagship initiative of the Ministry of Education designed to provide high-quality educational resources to all citizens. The platform hosts a wide range of Massive Open Online Courses covering various subjects from school to post-graduate levels. By offering free access to digital content and interactive learning modules, SWAYAM aims to bridge the digital divide for students and lifelong learners.

41. (B) To connect all Gram Panchayats in India with high-speed optical fibre networks
BharatNet is a major infrastructure project aimed at providing high-speed broadband connectivity to over 250,000 Gram Panchayats across rural India. By laying a vast network of optical fiber, the project seeks to facilitate the delivery of various e-governance, e-health, and e-education services to rural citizens. This connectivity is essential for fostering economic growth and social development in remote areas.

42. (C) Atomicity
In the context of database transactions, Atomicity is a core property ensuring that a transaction is treated as a single, indivisible unit. This means that either all operations within the transaction are completed successfully, or none of them are applied at all. This prevents partial updates that could lead to data inconsistency, which is critical for maintaining financial records and other sensitive information.

43. (B) By developing early warning systems and simulating disaster scenarios
During the preparedness phase, ICT is used to enhance readiness for potential disasters. This includes using satellite imaging and geographic information systems to map vulnerable areas and develop early warning systems. Additionally, computer simulations and modeling allow authorities to predict the impact of different

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disaster scenarios and plan effective evacuation routes and emergency response strategies before an event actually occurs.

44. (D) Agricultural commodities
e-NAM is a pan-India electronic trading portal that networks existing Agricultural Produce Market Committee mandis to create a unified national market for agricultural commodities. It allows farmers to sell their produce online, providing them with access to a larger pool of buyers and ensuring more transparent price discovery. This digital platform helps in reducing intermediaries and improving the income of farmers across the country.

45. (C) Promoting India as a global hub for IT/ITeS and electronics manufacturing
India's National Policy on Information Technology focuses on strengthening the country's position as a global leader in the IT and IT-enabled services sectors. A key objective is to encourage innovation, research, and development while promoting domestic electronics manufacturing. By creating a favorable ecosystem for technology companies, the policy aims to drive economic growth, create jobs, and enhance India's global competitiveness in the digital age.

46. (B) To integrate internal and external management information across an entire organization
The primary goal of an Enterprise Resource Planning system is to provide a unified platform that integrates all core business functions, such as finance, human resources, manufacturing, and supply chain management. By sharing a common database, the system ensures that information flows seamlessly between different departments. This integration improves data accuracy, enhances operational efficiency, and provides management with a comprehensive view of the entire organization.

47. (B) PMGDISHA
The Pradhan Mantri Gramin Digital Saksharta Abhiyaan is a significant government initiative specifically designed to impart digital literacy to six crore rural households. The scheme targets one person from every eligible family, teaching them how to operate digital devices, access government services, and perform digital payments. This massive effort is crucial for empowering rural citizens and ensuring they can participate in the digital economy.

48. (B) School Education and Teachers' Training
DIKSHA is a national platform for school education launched by the Government of India. It provides a comprehensive repository of digital resources for students and teachers, including interactive textbooks, lesson plans, and training modules. The platform is designed to support various languages and curricula, making it a valuable tool for enhancing the quality of education and professional development for teachers across the country.

49. (A) Content delivered directly over the internet bypassing traditional providers
Over-The-Top services refer to streaming media platforms that deliver content directly to viewers over the internet. This model bypasses traditional distribution channels like cable, satellite, and broadcast television. Users can access a wide range of movies, shows, and live events on various devices, including smartphones and smart TVs. OTT platforms have fundamentally changed media consumption by offering personalized, on-demand content to a global audience.

50. (C) Unified Payments Interface (UPI)
The Unified Payments Interface is a real-time payment system developed by the National Payments Corporation of India. It allows users to link multiple bank accounts into a single mobile application, enabling seamless peer-to-peer and person-to-merchant transactions. With its simple and secure interface, UPI has revolutionized digital payments in India, making it easy for citizens to transfer money and pay for goods and services instantly.

51. (D) Establishing overseas technology colonies
The Digital India programme is built on three main vision areas: providing digital infrastructure as a core utility to every citizen, ensuring governance and services are available on demand, and achieving the digital empowerment of citizens. These goals focus on transforming India's domestic technological landscape. The establishment of overseas technology colonies is not an objective of this programme, as its focus is on internal national development.

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52. (D) Spatial or geographic data
Geographic Information Systems are specialized tools designed to work with spatial or geographic data. This includes information about the location and characteristics of features on the Earth's surface. GIS allows users to layer different types of data, such as topography, land use, and population density, on a map. This spatial analysis is essential for urban planning, environmental monitoring, and managing natural resources effectively.

53. (C) Complete immunity from unauthorized access and data breaches
While Electronic Health Records offer many benefits, such as improved legibility and better coordination among providers, they are not completely immune to security risks. Like any digital system, EHRs are vulnerable to unauthorized access, cyberattacks, and data breaches. Ensuring the privacy and security of patient information requires robust encryption, strict access controls, and constant monitoring, making absolute immunity an unrealistic claim in the digital landscape.

54. (C) Wide availability of high-speed broadband in rural villages
The digital divide in India is primarily caused by factors such as the high cost of devices, lack of digital literacy, and the shortage of regional language content. These barriers prevent many citizens from accessing the benefits of technology. The wide availability of high-speed broadband in rural areas would actually help bridge the divide, rather than cause it, by providing the necessary infrastructure for digital inclusion.

55. (A) Telematics
Telematics is an interdisciplinary field that combines telecommunications and informatics to monitor and manage vehicles. In logistics, telematics systems use GPS and onboard sensors to track a vehicle's real-time location, speed, and fuel consumption. This data is transmitted to a central server, allowing fleet managers to optimize routes, improve driver safety, and enhance overall operational efficiency, making it a vital component of modern transportation.

56. (A) Transaction Processing System
An Automated Teller Machine system is a classic example of a Transaction Processing System. Its primary function is to record and process individual bank transactions, such as cash withdrawals and balance inquiries, in real-time. TPS are designed to handle high volumes of routine data accurately and efficiently, ensuring that each transaction is completed securely and that the bank's central database is updated immediately.

57. (B) 50 Mbps
The National Digital Communications Policy 2018 set an ambitious goal to provide universal broadband connectivity with a speed of 50 Mbps to every citizen. This policy aimed to enhance India's digital infrastructure to support a growing digital economy and ensure that all individuals have access to high-quality internet services. Achieving this speed is seen as essential for enabling advanced applications like tele-education, tele-medicine, and e-governance.

58. (A) Telemedicine and online OPD services
eSanjeevani is a prominent national telemedicine platform that provides online outpatient department services to citizens. It allows patients to consult with doctors remotely via video conferencing, which is particularly beneficial for those living in rural or underserved areas. By facilitating digital consultations and electronic prescriptions, eSanjeevani improves access to quality healthcare while reducing the need for patients to travel long distances to reach medical facilities.

59. (C) To deliver internet content quickly using geographically distributed servers
A Content Delivery Network is a network of geographically distributed servers that work together to provide fast delivery of internet content. By caching content like images, videos, and scripts closer to the user's location, CDNs significantly reduce latency and improve website loading speeds. This is crucial for modern digital media, where high-quality content needs to be delivered reliably and quickly to users all around the world.

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scale, high speed of generation, and diverse formats of modern datasets.

27. (A) Accumulating transactions over time and processing them together in a group
Batch processing involves collecting a set of data transactions over a period and then processing the entire group at once. This method is often used for non-time-sensitive tasks like payroll or monthly billing, where processing large volumes of data together is more efficient than handling each transaction individually. It contrasts with real-time processing, where data is handled immediately upon entry.

28. (A) P-2, Q-3, R-1, S-4
Amazon Web Services EC2 provides virtualized servers, representing Infrastructure as a Service. Google App Engine offers a platform for developers to build apps, fitting Platform as a Service. Google Workspace delivers ready-to-use software over the internet, classifying it as Software as a Service. Oracle Data Cloud provides data-related services, making it an example of the Data as a Service model.

29. (C) To facilitate military and academic resource sharing across vast distances
ARPANET, funded by the U.S. Department of Defense, was the first wide-area packet-switching network and the precursor to the modern internet. Its primary objective was to allow researchers at different universities and military institutions to share expensive computing resources and exchange data. This pioneering project established the foundational protocols and technologies that enable global digital communication today.

30. (D) Data, Information, Knowledge, Wisdom
The DIKW hierarchy represents the structural relationship between different levels of understanding. It starts with raw data at the base, which is processed into meaningful information. Information is then synthesized into knowledge through experience and learning. Finally, wisdom sits at the apex, representing the ability to apply knowledge and deep understanding to make sound judgments and solve complex problems.

31. (C) Bhuvan
Bhuvan is a powerful Indian web-based portal developed by the Indian Space Research Organisation. It provides high-resolution satellite imagery and various geographic information services specifically tailored for the Indian subcontinent. Users can access data related to agriculture, water resources, and urban planning. Unlike commercial platforms like Google Earth, Bhuvan offers specialized datasets and tools designed for national development and research.

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32. (B) Tsunamis
The Indian National Centre for Ocean Information Services utilizes sophisticated ICT systems, including deep-sea pressure sensors and satellite communication, to monitor seismic activity and sea-level changes. Its primary mission is to provide timely and accurate early warnings for tsunamis to coastal communities. This helps in minimizing loss of life and property by enabling rapid evacuation and disaster response measures during oceanic emergencies.

33. (B) High costs and complex business process reengineering
Implementing an Enterprise Resource Planning system is a significant undertaking that requires substantial financial investment in software and hardware. Furthermore, it often necessitates a complete overhaul of existing business processes to align with the new system's structure. This complexity, combined with the need for extensive employee training and data migration, represents a major hurdle for most large organizations.

34. (D) Tools and software designed to help people with disabilities use computers
Assistive Technology encompasses a wide range of devices and software applications specifically created to improve the functional capabilities of individuals with disabilities. Examples include screen readers for the visually impaired, specialized keyboards for those with motor difficulties, and voice recognition software. These tools play a vital role in promoting digital inclusion by making information technology accessible to everyone, regardless of physical limitations.

68. (B) The delivery of computing services such as servers and storage over the Internet
Cloud computing refers to the on-demand delivery of various computing resources, including servers, storage, databases, networking, and software, over the internet. Instead of maintaining their own physical servers, users can access these services from cloud providers on a pay-as-you-go basis. This model offers greater flexibility, scalability, and cost-efficiency, allowing organizations and individuals to use high-performance computing resources without significant upfront investment in hardware.

69. (C) SDG 9 (Industry, Innovation and Infrastructure)
Sustainable Development Goal 9 focuses on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. Within this goal, there is a specific target to significantly increase access to information and communications technology and strive to provide universal and affordable access to the internet in least developed countries. ICT is recognized as a fundamental driver for achieving all the SDGs by enhancing productivity and connectivity.

70. (C) Allocating global radio spectrum and satellite orbits
The International Telecommunication Union is a specialized United Nations agency responsible for coordinating global telecommunications. One of its primary functions is to manage and allocate the global radio-frequency spectrum and satellite orbits to ensure that different communication systems do not interfere with each other. The ITU also develops international standards for telecommunications and works to improve access to ICTs in underserved regions around the world.

71. (A) Wisdom is the lowest and most basic tier of the hierarchy.
In the DIKW hierarchy, data is the most basic tier, consisting of raw facts and figures. Wisdom is actually located at the very apex of the pyramid, representing the highest level of understanding. While data is foundational, wisdom requires the ability to apply knowledge and insight to make sound judgments. The statement that wisdom is the lowest tier is therefore incorrect, as it reverses the hierarchy's logical structure.

72. (B) The number of telephone connections for every hundred individuals in an area
Teledensity is a key metric used to measure the level of telecommunication penetration within a specific population. It is calculated by dividing the total number of telephone connections, including both landlines and mobile phones, by the total population and multiplying by one hundred. This indicator provides valuable insight into the accessibility and development of communication infrastructure in different regions and countries around the world.

73. (D) Veracity
In the context of Big Data, Veracity refers to the uncertainty and unreliability often associated with data sources. Because Big Data is often collected from diverse and unstructured origins, such as social media and sensors, its accuracy and quality can vary significantly. Managing veracity involves identifying and addressing inconsistencies, biases, and errors to ensure that the resulting analysis is based on trustworthy and high-quality information.

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74. (C) SVG
Scalable Vector Graphics is an XML-based image format for two-dimensional graphics that supports both interactivity and animation. Unlike raster formats like JPEG or BMP, SVG images are based on mathematical vectors, which means they can be scaled to any size without losing quality. The SVG standard is maintained by the World Wide Web Consortium and is widely used for icons, logos, and illustrations on the web.

75. (D) One person from every eligible rural household
The PMGDISHA scheme is specifically designed to bridge the digital divide in rural India by providing digital literacy training to eligible citizens. The programme aims to cover one person from every eligible rural household, with a focus on reaching those who have not yet had the opportunity to learn digital skills. By targeting a large number of rural families, the scheme seeks to ensure that at least one member can use technology.

76. (D) To serve as front-end delivery points for public, private, and social services to rural citizens
Common Service Centres are a cornerstone of the National e-Governance Plan, acting as the primary delivery points for various digital services in rural areas. These centers are run by local entrepreneurs and provide citizens with access to government applications, banking, insurance, and other essential services. By bringing these services directly to the village level, CSCs help in improving the transparency and efficiency of service delivery in remote regions.

77. (D) Edge computing processes data near the network's periphery where the data is generated
The key operational difference between edge and cloud computing is the location where data processing occurs. Traditional cloud computing involves sending data to centralized, remote servers for processing. Edge computing, however, performs data processing locally on devices or nearby servers. This proximity significantly reduces the time it takes for data to travel, resulting in lower latency and more efficient bandwidth usage for real-time applications and services.

78. (D) Geneva, Switzerland
The International Telecommunication Union is headquartered in Geneva, Switzerland. As a specialized agency of the United Nations, the ITU plays a crucial role in coordinating global telecommunications and developing international standards for information and communication technologies. Its location in Geneva places it at the center of international diplomacy and collaboration, allowing it to work closely with other global organizations to promote digital connectivity and innovation worldwide.

79. (B) To support better business decision-making by analyzing historical and current data
Business Intelligence refers to the technologies and strategies used by organizations to collect, analyze, and present data to support informed decision-making. By transforming raw data into meaningful insights, BI tools help managers understand historical performance, identify current trends, and predict future outcomes. This analytical approach enables businesses to optimize their operations, identify new opportunities, and gain a competitive advantage in the marketplace through data-driven strategies.

80. (D) Lossy compression
The JPEG format uses a lossy compression technique to reduce the file size of photographic images. This process involves discarding some of the image data that is less perceptible to the human eye. While this results in a much smaller file, it also leads to a slight reduction in image quality, especially if the image is compressed multiple times. Lossy compression is highly effective for web graphics and digital photography where storage space is limited.

81. (D) Wi-Fi
2G, 3G, and 4G represent different generations of cellular mobile communication technologies, each offering significant improvements in speed and data capacity. Wi-Fi, however, is a wireless local area networking technology based on the IEEE 802.11 standards. While it provides wireless internet access, it is fundamentally different from cellular generations as it typically operates within a limited range and relies on a local router rather than a wide-area cellular network.

82. (A) Geneva and Tunis
The World Summit on the Information Society was conducted in two distinct phases to address global digital issues. The first phase took place in Geneva in 2003, focusing on establishing a common vision and principles for the information society. The second phase was held in Tunis in 2005, which concentrated on implementing the Geneva plan of action and addressing issues related to internet governance and financing for ICT development in various nations.

83. (D) ISO (International Organization for Standardization)
The International Organization for Standardization is a global federation of national standards bodies. It is responsible for developing and publishing a wide range of international standards that ensure the quality, safety, and efficiency of products and services. In the field of ICT, ISO is well-known for creating the Open Systems Interconnection model, which provides a standard framework for different computer systems to communicate over a network.

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84. (C) By facilitating e-learning, distance education, and access to digital resources
ICT contributes significantly to Sustainable Development Goal 4, which aims to ensure inclusive and equitable quality education. By providing platforms for e-learning and distance education, technology allows students in remote areas to access high-quality educational resources. Additionally, digital libraries and interactive tools enhance the learning experience and support professional development for teachers. This helps in bridging the educational gap and promoting lifelong learning opportunities for all.

85. (C) Private Cloud
A private cloud is a cloud computing deployment model where the infrastructure is provisioned for the exclusive use of a single organization. This organization may consist of multiple consumers or business units. A private cloud can be owned, managed, and operated by the organization itself or by a third party, and it may exist on or off-premises. This model offers greater security and control compared to public clouds.

86. (B) World Economic Forum (WEF)
The Network Readiness Index was originally launched by the World Economic Forum to assess the ability of countries to leverage information and communication technologies for development and competitiveness. The index evaluates factors such as the regulatory environment, infrastructure, and the usage of ICT by individuals, businesses, and governments. While the NRI is now published by other organizations like the Portulans Institute, its origins are firmly rooted in the WEF.

87. (B) Reduces latency and bandwidth usage by analyzing data locally
Edge computing is particularly beneficial for Internet of Things devices because it allows data to be processed and analyzed locally, rather than being sent to a distant cloud server. This local processing significantly reduces latency, which is critical for real-time IoT applications like autonomous vehicles or industrial sensors. Furthermore, by filtering data at the edge, it reduces the amount of information that needs to be transmitted over the network, optimizing bandwidth usage.

88. (B) The ability of computer systems or software to exchange and make use of information
Interoperability is a fundamental principle in ICT that refers to the ability of diverse computer systems, applications, and networks to work together and exchange information seamlessly. This is achieved through the use of common standards and protocols that allow different technologies to communicate regardless of their manufacturer or underlying architecture. Interoperability is essential for building integrated systems and ensuring that data can be shared effectively across various platforms.

89. (B) Identify the likelihood of future outcomes based on historical data patterns
Predictive analytics is a branch of advanced analytics that uses historical data, statistical algorithms, and machine learning techniques to identify the likelihood of future outcomes. By analyzing past patterns and trends, organizations can make informed predictions about future events, such as customer behavior or market shifts. This foresight allows businesses to proactively address potential challenges and capitalize on new opportunities, improving their overall decision-making and strategic planning processes.

90. (A) Lossless compression
Lossless compression is a data reduction technique that allows the original data to be perfectly reconstructed from the compressed file. Unlike lossy compression, it does not discard any information during the process. This makes it ideal for files where every bit of data is important, such as text documents, executable programs, and certain types of high-quality images and audio. Common examples of lossless compression include ZIP files and the FLAC audio format.

91. (B) National Database for Emergency Management
The National Database for Emergency Management is a critical portal in India designed to support disaster management activities. It provides a centralized repository of spatial and non-spatial data required for disaster risk reduction, preparedness, and response. By integrating information from various departments and agencies, NDEM allows authorities to visualize vulnerabilities, plan

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60. (B) NEFT operates in batches while RTGS settles transactions continuously in real-time
NEFT and RTGS are two major electronic fund transfer systems in India. The fundamental difference lies in their settlement methods. NEFT processes transactions in half-hourly batches throughout the day. In contrast, Real Time Gross Settlement processes each transaction individually and continuously as it occurs. This makes RTGS suitable for high-value, urgent transfers that require immediate settlement, while NEFT is typically used for smaller, less time-sensitive payments.

61. (C) To bridge the global digital divide and build a people-centered information society
The World Summit on the Information Society was a global effort to address the challenges and opportunities posed by the digital revolution. Its primary objective was to foster a common vision for a people-centered, inclusive, and development-oriented information society. This involves bridging the digital divide by ensuring that everyone can access and utilize information and communication technologies to improve their quality of life and achieve sustainable development.

62. (A) Hadoop
Hadoop is a popular open-source framework designed for storing and processing massive amounts of data across clusters of computers. It uses the MapReduce programming model to divide large tasks into smaller ones that can be executed in parallel. This distributed processing approach makes it highly scalable and cost-effective for handling Big Data, allowing organizations to analyze vast datasets that would be impossible to manage on a single machine.

63. (A) Village Level Entrepreneur (VLE)
A Village Level Entrepreneur is an individual responsible for operating a Common Service Centre at the grassroots level. These entrepreneurs play a vital role in providing various digital services to rural citizens, such as government application filing, banking, and insurance. By running these centers as a business, VLEs not only provide essential services but also promote local entrepreneurship and digital literacy within their respective communities.

64. (C) Cloud computing data centers and edge devices
Fog computing is a decentralized computing architecture that extends cloud services to the edge of the network. It acts as an intermediary layer between centralized cloud data centers and local edge devices, such as sensors and smartphones. By processing some data closer to where it is generated, fog computing reduces latency, optimizes bandwidth, and improves the efficiency of Internet of Things applications.

65. (A) Mechanical energy
Multimedia is defined by the integration of various digital media formats, including text, audio, images, animation, and video. These elements are combined to convey information in an interactive and engaging manner. Mechanical energy, which relates to physical motion and power, is not a form of digital media and therefore does not fall under the standard categories of multimedia elements used in computing and communication.

66. (A) CSC e-Governance Services India Limited
CSC e-Governance Services India Limited is the central implementing agency for the Pradhan Mantri Gramin Digital Saksharta Abhiyaan. It coordinates the massive effort to provide digital literacy training to rural households across the country through its extensive network of Common Service Centres. This agency ensures that the programme reaches eligible citizens and that the training is conducted effectively to achieve the national goal of digital empowerment.

67. (C) Universal Service Obligation Fund (USOF)
The BharatNet project is funded primarily by the Universal Service Obligation Fund, which is managed by the Department of Telecommunications. The USOF is created through a levy on the revenue of telecommunication service providers to ensure that telecom services are available to people in rural and remote areas at affordable prices. This funding is crucial for building the massive broadband infrastructure required to connect all Gram Panchayats.

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This includes everything from online retail and digital payments to electronic data interchange and online auctions. While telemedicine, e-NAM, and e-learning are important ICT applications, the definition provided for e-commerce correctly describes the commercial transactions that take place in the digital marketplace through various online platforms.

100. (D) Statement I is incorrect and Statement II is correct

The Digital India initiative is a comprehensive programme that includes several pillars, such as e-Kranti, which focuses on the electronic delivery of government services. Contrary to the first statement, the initiative also emphasizes the importance of cybersecurity frameworks to protect citizens' data and ensure a secure digital environment. Therefore, the claim that it ignores cybersecurity is false, while the description of e-Kranti as an essential pillar for service delivery is correct.

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CHAPTER 17
Internet Technologies and Protocols

1. Which network device is most critically responsible for directing data packets between different computer networks to reach their destination?
(A) Switch
(B) Hub
(C) Modem
(D) Router

2. If a user can successfully access a website by typing its IP address into a browser but cannot access it by typing its domain name, which protocol or service is most likely failing?
(A) Hypertext Transfer Protocol (HTTP)
(B) Dynamic Host Configuration Protocol (DHCP)
(C) Domain Name System (DNS)
(D) Address Resolution Protocol (ARP)

3. Which of the following best defines the relationship between the Internet and the World Wide Web?
(A) The Internet and the World Wide Web are widely considered interchangeable synonyms for the exact same global computer network.
(B) The World Wide Web acts as the global hardware infrastructure, while the Internet is a software application that runs upon it.
(C) The Internet is a network of networks, while the Web is an information model built upon it.
(D) The World Wide Web serves as a fundamental hardware component within the physical architecture of the global Internet structure.

4. Match List-I with List-II regarding network protocols and select the correct answer:
List I: (Application Layer Protocol)
P. HTTP
Q. HTTPS
R. FTP
S. SMTP
List II: (Default Port Number)
1. Port 21
2. Port 25
3. Port 80
4. Port 443
(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-1, R-4, S-2
(D) P-1, Q-2, R-3, S-4

5. Fiber optic internet connections are largely immune to electromagnetic interference (EMI). What is the primary reason for this?
(A) They utilize copper wiring protected by heavy layers of metallic electromagnetic shielding.
(B) They transmit data via light through glass strands instead of electrical currents.
(C) They rely on a decentralized grid of underground mechanical switches and high-speed routers.
(D) They function primarily through the use of low-frequency radio waves across the spectrum.

6. Which of the following is an exception to the protocols operating in the TCP/IP Application Layer?
(A) Internet Message Access Protocol (IMAP)
(B) Internet Control Message Protocol (ICMP)
(C) Domain Name System (DNS)
(D) Post Office Protocol version 3 (POP3)

7. Which of the following is widely regarded as the first functional prototype of the modern internet?
(A) NSFNET
(B) ARPANET
(C) TELNET
(D) CYCLADES

8. Identify the correct statement regarding IPv6.
(A) It was created because the physical cables carrying IPv4 traffic became obsolete.

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(B) It addresses the exhaustion of IP addresses by utilizing a 128-bit address structure.
(C) It is expressed primarily using a dotted-decimal format.
(D) It restricts internet traffic exclusively to local area networks.

9. In the context of a Uniform Resource Locator (URL), what does the protocol identifier specify?
(A) The physical location of the server hosting the website.
(B) The specific method used to retrieve information from a server.
(C) The name of the company managing the website.
(D) The file extension of the target resource.

10. Which entity launched the first publicly available internet service in India on August 15, 1995?
(A) Bharat Sanchar Nigam Limited (BSNL)
(B) Mahanagar Telephone Nigam Limited (MTNL)
(C) Videsh Sanchar Nigam Limited (VSNL)
(D) National Informatics Centre (NIC)

11. Consider the following statements about internet protocols:
I. FTP securely encrypts all passwords and data by default.
II. SMTP is used to push outbound emails to a mail server.
III. POP3 downloads emails from a server and typically removes them from the server.
IV. IMAP synchronizes the state of emails across multiple devices.
Which combination of the above statements is incorrect?
(A) I only
(B) II and III only
(C) III and IV only
(D) I and IV only

12. Consider the following milestones in the history of the internet:
I. Launch of the Mosaic web browser
II. Establishment of the ARPANET
III. Introduction of the World Wide Web by Tim Berners-Lee
IV. Adoption of TCP/IP as the standard networking protocol
Which of the following represents the correct chronological order of their occurrence?
(A) II, IV, III, I
(B) II, III, IV, I
(C) IV, II, III, I
(D) II, IV, I, III

13. What is the primary function of the Domain Name System (DNS)?
(A) To translate human-readable domain names into machine-readable IP addresses.
(B) To encrypt network traffic and protect user privacy.
(C) To assign dynamic IP addresses to new devices on a network.
(D) To store cached versions of web pages for faster loading.

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14. Which of the following is typically considered a disadvantage of satellite internet connectivity compared to fiber broadband?
(A) It lacks the capability for deployment in isolated geographical or remote rural locations.
(B) It remains heavily dependent on pre-existing physical infrastructure such as telephone lines.
(C) It suffers from higher latency due to the immense distance data must travel.
(D) It offers significantly lower overall bandwidth than antiquated dial-up modem connections.

15. Which of the following best contrasts the Transmission Control Protocol (TCP) and the User Datagram Protocol (UDP)?
(A) TCP manages low-quality video streaming, while UDP handles secure corporate email exchanges.
(B) TCP functions as an IPv4-only protocol, while UDP is reserved for next-generation IPv6 traffic.
(C) TCP encrypts all internal data payloads, whereas UDP relies on external plain-text transmission.
(D) TCP provides connection-oriented, reliable delivery, while UDP offers connectionless, best-effort delivery.

16. The Advanced Research Projects Agency Network (ARPANET) was primarily developed under the direction of which organization?
(A) United States Department of Defense
(B) European Organization for Nuclear Research (CERN)
(C) International Telecommunication Union
(D) Massachusetts Institute of Technology

17. What makes HTTPS fundamentally more secure than standard HTTP?
(A) It encrypts the protocol using Transport Layer Security (TLS) or Secure Sockets Layer (SSL).
(B) It routes packet traffic through dark web nodes to mask the user's primary IP address.
(C) It uses advanced file compression algorithms that make data streams impossible to scan.
(D) It mandates the use of multi-factor biometric authentication for every standard web page visit.

18. Which of the following is an odd one out among the routing protocols used to map packet pathways across networks?
(A) Post Office Protocol (POP3)
(B) Open Shortest Path First (OSPF)
(C) Border Gateway Protocol (BGP)
(D) Routing Information Protocol (RIP)

19. Consider the following statements regarding Domain Name System records:
I. An A record maps a domain name to an IPv4 address.
II. An AAAA record maps a domain name to an IPv6 address.
III. An MX record is used to direct email to a specified mail server.
Which of the above combinations is correctly matched?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

20. Which of the following provides the correct ascending order of address space sizes for common network identifiers?
(A) IPv4 address, MAC address, IPv6 address
(B) MAC address, IPv4 address, IPv6 address
(C) IPv4 address, IPv6 address, MAC address
(D) IPv6 address, MAC address, IPv4 address

21. The File Transfer Protocol (FTP) is primarily utilized for what purpose?
(A) Resolving IP addresses from MAC addresses.
(B) Executing scripts securely on remote servers.
(C) Uploading and downloading files between a client and a server.
(D) Synchronizing clocks across distributed computer networks.

22. How is data primarily transmitted across the internet?
(A) As continuous analog waves traveling point-to-point.
(B) By being broken down into small, distinct packets that are reassembled at the destination.
(C) Through dedicated circuit-switched paths that remain open for the duration of the communication.
(D) Exclusively via encrypted satellite transmissions.

23. Which broadband technology transmits data by converting electrical signals into light pulses?
(A) Digital Subscriber Line (DSL)
(B) Coaxial Cable
(C) Satellite Internet
(D) Fiber Optic

24. By default, which network port is used by unencrypted HTTP traffic?
(A) Port 21
(B) Port 25
(C) Port 80
(D) Port 443

25. Read the following statements regarding IP addressing:
Statement I: A single device can possess different IP addresses when connecting to different networks.
Statement II: A MAC address remains constant regardless of the network the device is connected to.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are

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incorrect.
(C) Statement I is correct, but Statement II is incorrect.
(D) Statement I is incorrect, but Statement II is correct.

26. Identify the incorrect statement regarding the development of the World Wide Web.
(A) It was invented by Tim Berners-Lee in 1989.
(B) It was originally developed at CERN to help scientists share data.
(C) It relies on the Hypertext Transfer Protocol (HTTP).
(D) It was fundamentally designed to replace the TCP/IP protocol suite.

27. Which of the following protocols belongs to the Transport Layer of the TCP/IP suite, as opposed to the Application Layer?
(A) Transmission Control Protocol (TCP)
(B) Hypertext Transfer Protocol (HTTP)
(C) File Transfer Protocol (FTP)
(D) Simple Mail Transfer Protocol (SMTP)

28. Consider the following statements regarding Internet Service Providers:
I. Tier 1 ISPs own global network infrastructure and peer with each other without paying transit fees.
II. Tier 3 ISPs primarily purchase internet transit from Tier 1 and Tier 2 providers to serve end consumers.
III. Tier 2 ISPs engage in peering agreements but also purchase transit to reach some portions of the internet.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

29. Which part of the URL "https://www.example.com/index.html" represents the Top-Level Domain (TLD)?
(A) https
(B) www
(C) com
(D) example

30. What is the length of an IPv4 address?
(A) 16 bits
(B) 32 bits
(C) 64 bits
(D) 128 bits

31. Which of the following represents a correct statement regarding the core function of a web browser?
(A) A web browser is essentially a database server that stores global website data.
(B) A web browser directly assigns IP addresses to individual web servers.
(C) A web browser parses and renders HTML code to display webpages visually to the user.
(D) A web browser operates exclusively at the network layer of the OSI model.

32. In the context of fundamental web technologies, identify the correct pair.
(A) HTML - Controls the interactive behavior and dynamic logic of the webpage.
(B) CSS - Controls the visual presentation, layout, and styling of the webpage.
(C) JavaScript - Primarily structures text into paragraphs and headings.
(D) PHP - Executes exclusively within the user's web browser environment.

33. Read the following statements regarding network resolution:
Statement I: ARP is responsible for resolving an IP address into a physical MAC address on a local area network.
Statement II: ARP requests are typically broadcasted to all devices on the local network segment.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct, but Statement II is incorrect.
(D) Statement I is incorrect, but Statement II is correct.

34. Which of the following represents the correct sequence of software agents involved in sending an email from a sender to a recipient?
(A) Mail User Agent (MUA), Mail Transfer Agent (MTA), Mail Delivery Agent (MDA),

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Q. Web 2.0
R. Web 3.0
S. Dark Web

List II: (Primary Characteristic)

1. Decentralization and Semantic Web
2. Read-only static web pages
3. Unindexed networks requiring special routing software
4. Interactive, collaborative user-generated content

(A) P-2, Q-4, R-1, S-3
(B) P-1, Q-2, R-4, S-3
(C) P-2, Q-1, R-4, S-3
(D) P-4, Q-2, R-3, S-1

51. Identify the odd one out among the following digital collaboration and communication tools.
(A) Zoom
(B) Microsoft Teams
(C) Cisco Webex
(D) Adobe Photoshop

52. Which software application is widely recognized as the first graphical web browser that popularized the World Wide Web in the early 1990s?
(A) Internet Explorer
(B) Google Chrome
(C) Netscape Navigator
(D) Mosaic

53. In the context of Search Engine Optimization, what does the term "keyword stuffing" define?
(A) The intentional use of relevant search terms within the body of high-quality informative articles.
(B) The commercial process of bidding on priority keywords through specialized search advertising platforms.
(C) The practice of overloading a page with keywords to manipulate search engine rankings.
(D) The automated system used to correct spelling errors within a user's initial search query.

54. All of the following are standard use cases for HTTP cookies except:
(A) Keeping a user authenticated and logged into an account.
(B) Remembering site preferences and user settings.
(C) Recompiling computer operating system files for faster performance.
(D) Tracking user browsing history across multiple domains for advertising.

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55. Read the following statements regarding website development:
Statement I: Dynamic websites typically rely on server-side scripting languages and databases.
Statement II: Content Management Systems (CMS) like WordPress are primarily used to build static websites.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct, but Statement II is incorrect.
(D) Statement I is incorrect, but Statement II is correct.

56. Identify the incorrect pair regarding internet protocols and their primary functions.
(A) ARP - MAC to IP resolution
(B) DNS - Domain to IP resolution
(C) DHCP - Dynamic IP assignment
(D) HTTP - Webpage data transfer

57. What does Voice over Internet Protocol (VoIP) fundamentally do?
(A) It converts analog voice signals into digital data packets for transmission over IP networks.
(B) It routes traditional analog telephone calls over copper lines exclusively.
(C) It enhances voice clarity by utilizing strictly offline local networks.
(D) It restricts internet bandwidth dynamically to prioritize file downloads over voice calls.

58. Consider the following statements related to Search Engine Optimization:
I. Keyword stuffing is considered a legitimate White Hat SEO technique.
II. Creating quality backlinks from reputable sites is an Off-Page SEO strategy.
III. Optimizing website load speed is a technical SEO practice.
IV. Cloaking is a Black Hat SEO technique

V. A hybrid cloud combines elements of both public and private cloud environments.

Which of the following combinations is correct?
(A) I, II, III, and V
(B) I, II, IV, and V
(C) II, III, IV, and V
(D) I, III, IV, and V

42. The physical address associated with a device's network interface controller (NIC) is known as the:
(A) Loopback address
(B) Default Gateway
(C) MAC address
(D) Broadcast address

43. In modern web development, which language is predominantly responsible for defining the structure and raw content of a webpage?
(A) Cascading Style Sheets (CSS)
(B) HyperText Markup Language (HTML)
(C) JavaScript (JS)
(D) Structured Query Language (SQL)

44. The transition from Web 1.0 to Web 2.0 is most characterized by a shift towards which of the following?
(A) The use of read-only static text pages with minimal user interaction or navigation.
(B) The shift toward decentralized blockchain databases and advanced semantic data structures.
(C) The reliance on command-line interfaces for basic text retrieval across global networks.
(D) The rise of user-generated content, interactive web applications, and social media.

45. A common issue experienced during VoIP or video conferencing calls is "jitter." What is the primary cause of jitter in this context?
(A) A complete failure of the Domain Name System.
(B) High levels of end-to-end encryption.
(C) Variations in the time delay of data packets arriving at the destination.
(D) Utilizing an overly fast broadband connection.

46. A newly connected laptop automatically receives an IP address, subnet mask, and default gateway without manual configuration. Which protocol is responsible for this?
(A) Address Resolution Protocol (ARP)
(B) Dynamic Host Configuration Protocol (DHCP)
(C) Border Gateway Protocol (BGP)
(D) Network Time Protocol (NTP)

47. In the standard structure of an email address (e.g., user@example.com), what does the segment following the "@" symbol represent?
(A) The email client software used by the sender.
(B) The domain name of the mail server hosting the user's account.
(C) The specific country the user resides in.
(D) The encryption standard used to secure the message.

48. Search engines discover new and updated web pages using automated software programs. What are these programs commonly called?
(A) Compilers
(B) Spiders or Crawlers
(C) Hypervisors
(D) Packet Sniffers

49. Consider the following statements about HTTP cookies:
I. Session cookies are temporarily stored in memory and deleted when the browser closes.
II. Persistent cookies remain on the hard drive until they expire or are manually deleted.
III. First-party cookies are set directly by the domain the user is currently visiting.
IV. Third-party cookies are commonly used for cross-site tracking and targeted advertising.
V. Cookies have the capability to independently execute malicious code or viruses on a user device.

Which combination of the above statements is incorrect?
(A) I, II, and III
(B) II, III, and IV
(C) V only
(D) I, IV, and V

50. Match List-I with List-II regarding web technologies and select the correct answer:
List I: (Web Generation)
P. Web 1.0

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(AMQP)

67. Which of the following is a correct statement regarding cloud storage services like Google Drive or Dropbox?
(A) Files stored in the cloud are saved exclusively on the physical hard drive of the user's local device.
(B) They fundamentally cannot be accessed via a mobile internet connection.
(C) They use synchronization agents to mirror local folder states with remote servers.
(D) They automatically decrypt all user files and index them publicly on search engines.

68. Read the following statements regarding Internet Governance:
Statement I: The internet is centrally owned and managed by the United Nations.
Statement II: ICANN is responsible for coordinating the maintenance and procedures of several databases related to the namespaces and numerical spaces of the Internet.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct, but Statement II is incorrect.
(D) Statement I is incorrect, but Statement II is correct.

69. In India, internet shutdowns and suspensions of telecom services are legally sanctioned primarily under which historical legislation, as applied via the 2017 Telecom Suspension Rules?
(A) Indian Telegraph Act, 1885
(B) Information Technology Act, 2000
(C) National Security Act, 1980
(D) Unlawful Activities (Prevention) Act, 1967

70. Which protocol suite is commonly utilized to secure internet communications across Virtual Private Networks by authenticating and encrypting IP packets?
(A) Simple Network Management Protocol (SNMP)
(B) Border Gateway Protocol (BGP)
(C) Internet Protocol Security (IPsec)
(D) Internet Group Management Protocol (IGMP)

71. Which of the following statements correctly describes the spectrum frequency bands utilized in 5G mobile networks?
(A) 5G uses a mix of low, mid, and high-band frequencies for coverage and speed.
(B) 5G operates exclusively in low-band frequencies below 1 GHz to prioritize range.
(C) 5G only uses millimeter wave high bands and cannot function on any lower bands.
(D) 5G functions purely on unlicensed Wi-Fi spectrum bands available to the public.

72. Match List-I with List-II regarding network services and select the correct answer:
List I: (Network Technology)
P. Content Delivery Network
Q. Virtual Private Network
R. Proxy Server
S. Firewall
List II: (Core Function)
1. Masks IP addresses and encrypts end-to-end data traffic
2. Filters and monitors incoming and outgoing network traffic
3. Caches web resources on edge servers to reduce global latency
4. Acts as an intermediary handling requests for clients seeking resources
(A) P-3, Q-1, R-4, S-2
(B) P-1, Q-3, R-2, S-4
(C) P-3, Q-4, R-1, S-2
(D) P-4, Q-2, R-3, S-1

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73. Identify the odd one out among the Regional Internet Registries (RIRs) that manage the allocation of Internet number resources in various regions of the world.
(A) APNIC
(B) ARIN
(C) RIPE NCC
(D) ICANN

74. Which of the following defines the "Deep Web"?
(A) Websites involved exclusively in illegal black-market trading.
(B) The physical underwater fiber-optic cables connecting continents.
(C) The portion of the internet that is not indexed by standard web search engines.

heavily penalized by search engines.
Which combination of the statements is correct?
(A) I, II, and III
(B) II, III, and IV
(C) I, III, and IV
(D) I, II, and IV

59. While browsing an e-commerce website, items added to a shopping cart are maintained even as the user navigates between different product pages. This statefulness is typically managed using which mechanism?
(A) Address Resolution Protocol (ARP) tables
(B) Dynamic Host Configuration Protocol (DHCP) logs
(C) Web sessions and cookies
(D) Domain Name System (DNS) caches

60. Web 3.0 relies heavily on decentralized architecture and blockchain technologies. What is the primary intended effect of this design?
(A) To restore the internet to a simplified read-only state for faster performance.
(B) To give users greater control over their data, bypassing centralized platforms.
(C) To implement strict regulation of online anonymity via government-issued IDs.
(D) To eliminate modern encryption methods to allow for easier data management.

61. A server that acts as an intermediary, receiving a request from a client, forwarding it to the target server, and returning the response back to the client, is definitively known as a:
(A) DNS server
(B) DHCP server
(C) Proxy server
(D) FTP server

62. What does the concept of "Net Neutrality" fundamentally advocate?
(A) That ISPs treat all data equally, without discrimination based on content or user.
(B) That government agencies monitor all traffic to ensure political balance and neutrality.
(C) That search engines display an equal volume of conflicting news articles on every topic.
(D) That registration for top-level domain names is provided to the public at no cost.

63. Which is the most appropriate technical term for the phenomenon where a streaming video pauses to load more data before playback can continue?
(A) Buffering
(B) Spoofing
(C) Phishing
(D) Ping sweeps

64. Match List-I with List-II regarding cybersecurity concepts and select the correct answer:
List I: (Cybersecurity/Privacy Concept)
P. Phishing
Q. Doxxing
R. Ransomware
S. DDoS
List II: (Definition)
1. Publishing private or identifying information about a particular individual online
2. Overwhelming a server with massive traffic to render it unavailable
3. Malicious software blocking data access until a financial demand is met
4. Fraudulent communication disguised as a legitimate source to steal sensitive data
(A) P-4, Q-1, R-3, S-2
(B) P-1, Q-4, R-2, S-3
(C) P-4, Q-2, R-1, S-3
(D) P-3, Q-1, R-4, S-2

65. In the context of the deeper layers of the internet, identify the correct pair.
(A) Deep Web - Consists of unindexed content like academic databases and private email inboxes.
(B) Surface Web - Requires special software like Tor to access.
(C) Dark Web - Highly indexed by traditional search engines like Google.
(D) Dark Web - Primarily utilized for public government transparency records.

66. All of the following are commonly utilized lightweight communication protocols optimized for IoT devices, except:
(A) Border Gateway Protocol (BGP)
(B) Message Queuing Telemetry Transport (MQTT)
(C) Constrained Application Protocol (CoAP)
(D) Advanced Message Queuing Protocol

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Mail User Agent (MUA)
(B) Mail Transfer Agent (MTA), Mail Delivery Agent (MDA), Mail User Agent (MUA), Mail Transfer Agent (MTA)
(C) Mail Delivery Agent (MDA), Mail User Agent (MUA), Mail Transfer Agent (MTA), Mail Delivery Agent (MDA)
(D) Mail User Agent (MUA), Mail Delivery Agent (MDA), Mail Transfer Agent (MTA), Mail Transfer Agent (MTA)

35. All of the following are examples of On-Page Search Engine Optimization techniques except:
(A) Acquiring inbound links from external high-authority domains.
(B) Optimizing title tags and meta descriptions.
(C) Enhancing URL structures to be descriptive.
(D) Using header tags correctly to format page content.

36. Read the following statements regarding video conferencing technologies:
Statement I: Video conferencing generally demands higher network bandwidth and lower latency compared to standard text-based emailing.
Statement II: High-definition video streaming relies heavily on compression codecs to reduce the required data transmission rate.
Which of the following options is correct?
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct, but Statement II is incorrect.
(D) Statement I is incorrect, but Statement II is correct.

37. What is the most appropriate reason a user would choose IMAP over POP3 for managing their email?
(A) They prefer to store and synchronize all email messages on the remote mail server.
(B) They want to implement end-to-end encryption to prevent unauthorized third-party access.
(C) They seek to guarantee the absolute fastest delivery speed for all outgoing communications.
(D) They frequently need to transmit exceptionally large compressed file attachments globally.

38. What is the most appropriate distinction between a static website and a dynamic website?
(A) Static sites feature embedded video content, while dynamic sites are limited to plain text.
(B) Static sites need constant connectivity, whereas dynamic sites are designed for offline use.
(C) Static sites are hosted in the cloud, while dynamic sites must use local server clusters.
(D) Static sites show the same content to everyone, while dynamic sites change per user.

39. Which of the following defines a "web tracking pixel"?
(A) A specific unit of color measurement used for calibrating professional high-definition monitors.
(B) A physical sensor installed on network routers to monitor and intercept encrypted packets.
(C) A type of malicious keystroke logger used to capture sensitive login credentials and passwords.
(D) A tiny, transparent image used in pages or emails to monitor and track user behavior.

40. Identify the odd one out from the following list of internet-related software and services.
(A) Google Search
(B) Bing
(C) DuckDuckGo
(D) Mozilla Firefox

41. Consider the following statements about Cloud Computing:
I. Infrastructure as a Service (IaaS) provides virtualized computing resources over the internet.
II. Platform as a Service (PaaS) provides hardware and software tools generally needed for application development.
III. Software as a Service (SaaS) delivers software applications over the internet on a subscription basis.
IV. A public cloud is operated strictly and exclusively for a single organization's internal use.

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(D) Archival backups of obsolete 1990s websites.

75. The "Internet of Things" (IoT) is best defined as:
(A) A highly classified military intranet isolated from public networks.
(B) A conceptual framework for the future migration of human consciousness into digital servers.
(C) The physical hardware infrastructure, such as cables and routers, that makes up the internet backbone.
(D) The network of physical objects embedded with sensors and software that connect and exchange data over the internet.

76. In internet media transmission, how does streaming inherently differ from downloading?
(A) Downloading requires continuous internet connection during playback, whereas streaming allows offline playback without saving files.
(B) Downloading is exclusively used for video content, while streaming is exclusively used for audio.
(C) Streaming consumes significantly less bandwidth overall than downloading an identically sized file.
(D) Streaming allows media to be played continuously while it is being delivered, without waiting for the entire file to save locally.

77. Which of the following provides the best distinction between an active digital footprint and a passive digital footprint?
(A) Active footprints are stored on local drives, while passive footprints reside in cloud storage.
(B) Active footprints are limited to social posts, while passive ones consist only of emails.
(C) Active footprints are easily deleted, whereas passive footprints are considered permanent records.
(D) Active footprints are user-submitted, whereas passive ones are collected without consent.

78. All of the following are accurate statements concerning Virtual Private Networks (VPNs), except:
(A) They create a secure, encrypted tunnel over a public network.
(B) They can bypass regional geo-blocking restrictions.
(C) They mask the user's true IP address from the destination server.
(D) They provide total anonymity that hides all activity from the VPN provider itself.

79. Identify the correct option after reading the assertion and reason provided below:
Assertion (A): The practice of zero-rating by telecom operators is often heavily criticized by advocates of Net Neutrality.
Reason (R): Zero-rating ensures that all internet data flows are completely free and treated equally without bias toward any particular content provider.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

80. Consider the following layers of the internet:
I. Dark Web
II. Surface Web
III. Deep Web
Which of the following represents the correct sequence of these layers based on their level of accessibility to the general public, starting from the most easily accessible to the least easily accessible?
(A) II, I, III
(B) II, III, I
(C) III, II, I
(D) I, III, II

81. A smart home security system uses an internet-connected camera that uploads motion-detected footage to a cloud server, which then alerts the owner's smartphone. This scenario is a direct application of which technology?
(A) Blockchain Architecture
(B) Deep Web Routing
(C) Internet of Things (IoT)
(D) Virtual Private Networking (VPN)

82. Identify the incorrect statement regarding Content Delivery Networks (CDNs).
(A) They permanently replace the need for the

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significantly enhanced security features and improved routing efficiency for modern networks.

9. (B) The specific method used to retrieve information from a server.
A protocol identifier in a URL specifies the set of rules or methods used to exchange data between a client and a server. It tells the browser exactly how to retrieve the requested resource, such as using HTTP for standard web pages or FTP for file transfers. This initial segment is crucial for establishing the proper communication channel before data transfer.

10. (C) Videsh Sanchar Nigam Limited (VSNL)
Videsh Sanchar Nigam Limited officially introduced public internet services in India on Independence Day in 1995. This milestone marked the beginning of the digital era in the country, providing citizens with access to global information networks. Initially launched in major cities, this service laid the groundwork for the rapid expansion of telecommunications and information technology across the entire Indian subcontinent.

11. (A) I only
The File Transfer Protocol was designed before modern security standards became prevalent and sends all data, including login credentials, in plain text. This lack of encryption makes it vulnerable to interception by unauthorized parties during transmission. In contrast, modern protocols like SMTP, POP3, and IMAP have evolved or are paired with security layers to protect sensitive user information and emails.

12. (A) II, IV, III, I
The evolution of the internet followed a specific sequence starting with the ARPANET in the late 1960s. Following this, TCP/IP was adopted as the standard protocol in 1983, providing a universal language for networks. The World Wide Web was then introduced in 1989 to organize information, followed by the Mosaic browser in 1993, which made the web visually accessible.

13. (A) To translate human-readable domain names into machine-readable IP addresses.
The primary role of the Domain Name System is to serve as a translation service that maps easily remembered domain names to specific numerical IP addresses. Computers and routers require these numbers to identify and locate servers across the global network. Without this system, users would be forced to memorize long strings of digits to access every website and online service.

14. (C) It suffers from higher latency due to the immense distance data must travel.
Satellite internet connections involve sending data to an orbiting satellite and back down to earth, covering enormous distances. This long round-trip journey creates significant latency, which is the delay before a data transfer begins following an instruction. While useful for remote areas lacking terrestrial infrastructure, this inherent delay makes real-time activities like gaming or video calls more difficult.

15. (D) TCP provides connection-oriented, reliable delivery, while UDP offers connectionless, best-effort delivery.
The Transmission Control Protocol is a connection-oriented protocol that ensures data is delivered reliably and in the correct order through error-checking and acknowledgments. In contrast, the User Datagram Protocol is connectionless and prioritizes speed over reliability by sending data without verifying receipt. This makes TCP ideal for web browsing and email, while UDP is preferred for streaming and online gaming.

16. (A) United States Department of Defense
The United States Department of Defense created the Advanced Research Projects Agency to develop technologies that could maintain communication in the event of a nuclear attack. Their work resulted in ARPANET, which utilized packet switching to connect various research institutions. This military-funded initiative proved that a decentralized network could be resilient, forming the technical and conceptual precursor to the modern public internet.

17. (A) It encrypts the protocol using Transport Layer Security (TLS) or Secure Sockets Layer (SSL).
Secure web communication is achieved by adding a layer of encryption to the standard transfer protocol using either SSL or its modern successor, TLS. This ensures that all data exchanged between the user's browser and the server remains private and protected from eavesdropping. By verifying

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(C) Transparent Open Relay
(D) Transport Object Resolution

91. Which registry manages the .in Country Code Top Level Domain (ccTLD) for India?
(A) Ministry of Electronics and Information Technology (MeitY) directly
(B) National Internet Exchange of India (NIXI)
(C) Telecom Regulatory Authority of India (TRAI)
(D) Centre for Development of Advanced Computing (C-DAC)

92. According to data published by the Telecom Regulatory Authority of India (TRAI), which sector shows a persistently higher internet and tele-density penetration in India?
(A) Rural areas exhibit higher penetration than urban areas.
(B) Tier-3 cities exhibit higher penetration than metropolitan cities.
(C) Urban areas exhibit significantly higher penetration than rural areas.
(D) Penetration is exactly equal across all demographic regions.

93. Identify the incorrect pair linking a mobile network generation to its primary technological advancement.
(A) 1G - Introduction of analog voice calls
(B) 2G - Introduction of digital voice and SMS capabilities
(C) 3G - Introduction of mobile broadband and basic video calling
(D) 4G - Introduction of decentralized blockchain networking

94. If an organization wants to grant remote employees highly secure access to its internal corporate server from public Wi-Fi networks, which technology is conceptually the most critical to deploy?
(A) A transparent proxy server
(B) A Content Delivery Network (CDN)
(C) A Virtual Private Network (VPN)
(D) A dynamic HTML website

95. Match List-I with List-II regarding Indian technology organizations and select the correct answer:
List I: (Indian Technology Organization/Entity)
P. NIXI
Q. CERT-In
R. TRAI
S. BBNL
List II: (Primary Role)
1. National nodal agency for responding to computer security incidents
2. Independent regulator of the telecommunications sector
3. Implementing agency for the BharatNet project
4. Manages internet exchanges and the .in country code top-level domain
(A) P-4, Q-1, R-2, S-3
(B) P-1, Q-4, R-3, S-2
(C) P-4, Q-2, R-1, S-3
(D) P-2, Q-1, R-4, S-3

96. Read the following statements regarding 5G deployment in India:
Statement I: 5G Non-Standalone (NSA) architecture utilizes existing 4G LTE core infrastructure to manage connections and mobility.
Statement II: 5G Standalone (SA) architecture requires a completely new, independently deployed 5G core network.
(A) Both Statement I and Statement II are correct.
(B) Both Statement I and Statement II are incorrect.
(C) Statement I is correct, but Statement II is incorrect.
(D) Statement I is incorrect, but Statement II is correct.

97. In the context of the International Telecommunication Union's classification for 5G capabilities, identify the correct pair.
(A) eMBB (Enhanced Mobile Broadband) - Focuses on incredibly high data rates for applications like virtual reality.
(B) URLLC (Ultra-Reliable Low Latency Communications) - Designed specifically to increase smartphone battery life.
(C) mMTC (Massive Machine Type Communications) - Primarily used for high-definition video streaming.
(D) eMBB - Focuses on connecting millions of low-power IoT devices per square kilometer.

NODIA

accessible via browsers. The internet provides the underlying transport mechanism, while the web provides a user-friendly interface for browsing and sharing interconnected documents.

27. (A) Transmission Control Protocol (TCP)
In the TCP/IP model, the transport layer is responsible for end-to-end communication and data integrity, with the Transmission Control Protocol being a primary example. While protocols like HTTP and FTP reside in the application layer to provide specific services to users, TCP handles the actual segmentation, sequencing, and reliable delivery of that data, ensuring it arrives accurately at the destination.

28. (D) I, II, and III
Internet Service Providers are organized into tiers based on their reach and relationships. Tier 1 providers own the backbone and peer freely, while Tier 3 providers are smaller local companies that buy access to serve residential customers. Tier 2 providers occupy the middle ground, using a combination of peering and paid transit. This hierarchical structure ensures global connectivity across various networks.

29. (C) com
A Top-Level Domain is the final segment of a domain name, located after the last dot in a URL. Common examples include .com for commercial entities, .org for organizations, and .edu for educational institutions. These extensions help categorize the purpose or geographical origin of a website and are managed by global organizations to maintain an organized and searchable internet.

30. (B) 32 bits
An IPv4 address is composed of four sets of numbers ranging from 0 to 255, separated by dots. In binary form, each of these four segments represents 8 bits, resulting in a total length of 32 bits for the entire address. This structure allows for approximately 4.3 billion unique combinations, which became insufficient as the number of internet devices grew.

31. (C) A web browser parses and renders HTML code to display webpages visually to the user.
The fundamental purpose of a web browser is to act as a client that requests information from web servers and translates it into a visual format. It reads the underlying code of a webpage, such as HTML and CSS, to display text, images, and videos to the user. Browsers provide the primary interface through which individuals interact with the web.

32. (B) CSS - Controls the visual presentation, layout, and styling of the webpage.
Cascading Style Sheets are used by web developers to define the visual layout and aesthetic appearance of a website. While HTML provides the basic structure, CSS controls elements such as colors, fonts, spacing, and positioning. This separation of content from design allows for greater flexibility and consistency across multiple pages, ensuring a professional and user-friendly experience on various devices.

33. (A) Both Statement I and Statement II are correct.
The Address Resolution Protocol is essential for local network communication because devices need to know the physical MAC address of a target to deliver data. When an IP address is known, a device broadcasts an ARP request to all nodes on the segment asking for the corresponding hardware address. Once the target responds, the sender can successfully encapsulate and deliver packets.

34. (A) Mail User Agent (MUA), Mail Transfer Agent (MTA), Mail Delivery Agent (MDA), Mail User Agent (MUA)
Sending an email involves a specific flow through various software agents. It starts with the Mail User Agent, which the sender uses to compose the message. It is then handed to a Mail Transfer Agent to move across the network. Finally, a Mail Delivery Agent places it in the recipient's mailbox, where their MUA can eventually retrieve and display it.

35. (A) Acquiring inbound links from external high-authority domains.
On-page optimization involves improving elements within a website, such as titles, content, and internal links, to improve its search engine ranking. However, acquiring backlinks from external websites is considered an off-page strategy because it involves factors outside the site owner's direct control. Both techniques are necessary for a comprehensive approach to

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ANSWERS

1. (D) Router
Routers are essential networking devices that operate at the network layer to forward data packets between different computer networks. They analyze the destination IP address to determine the most efficient path for data to travel. By connecting various local and wide area networks, they ensure that information reaches its intended destination across the complex global infrastructure of the internet.

2. (C) Domain Name System (DNS)
The Domain Name System acts as a phonebook for the internet, translating human-readable domain names into the numerical IP addresses required for machine communication. When a website is accessible only via its IP address, it signifies that the name resolution process is not functioning correctly. This service is vital for user-friendly navigation as it removes the need for memorizing numbers.

3. (C) The Internet is a network of networks, while the Web is an information model built upon it.
The internet represents the massive hardware infrastructure consisting of millions of interconnected computers, cables, and wireless links forming a global network. Conversely, the World Wide Web is an information-sharing model built on top of this network, utilizing protocols like HTTP to access linked documents. While often used interchangeably, the internet provides the connectivity while the web provides the content.

4. (A) P-3, Q-4, R-1, S-2
Different application layer protocols utilize specific default port numbers to facilitate organized communication over a network. Port 80 is the standard for unencrypted web traffic, while port 443 handles secure web connections. File transfers typically occur over port 21, and email transmission through SMTP uses port 25. These standardized assignments allow servers to identify and process incoming requests efficiently.

5. (B) They transmit data via light through glass strands instead of electrical currents.
Fiber optic technology utilizes pulses of light transmitted through thin strands of glass or plastic to carry data. Unlike copper wires which transmit electrical signals, light is not affected by electromagnetic fields from power lines or electronic equipment. This physical property makes fiber connections highly resistant to interference, ensuring high-speed data transmission remains stable and clear over long physical distances.

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6. (B) Internet Control Message Protocol (ICMP)
While most listed protocols like DNS and IMAP operate within the application layer to provide specific user services, the Internet Control Message Protocol functions at the network layer. It is primarily used by network devices to send error messages and operational information regarding packet delivery. Understanding these layer distinctions is fundamental to troubleshooting connectivity issues and managing data flow within the architecture.

7. (B) ARPANET
The Advanced Research Projects Agency Network, established by the United States Department of Defense, served as the initial foundation for modern networking. It introduced the revolutionary concept of packet switching, allowing multiple computers to communicate over a single network. This experimental project successfully demonstrated the viability of decentralized data sharing, eventually evolving into the global network structure known today.

8. (B) It addresses the exhaustion of IP addresses by utilizing a 128-bit address structure.
Internet Protocol version 6 was developed to succeed IPv4 due to the limited number of available addresses in the 32-bit system. By utilizing a 128-bit address structure, it provides a virtually inexhaustible supply of unique identifiers for billions of devices. These addresses are represented in hexadecimal format, offering

collaboration transformed the internet into a dynamic ecosystem driven by user engagement.

45. (C) Variations in the time delay of data packets arriving at the destination.
Jitter occurs when there is a variation in the delay between data packets as they travel across a network. In real-time communications like video calls, packets must arrive at a steady pace to be reassembled smoothly. If the timing varies significantly, the audio or video may become choppy or distorted, negatively affecting the overall quality of the communication experience.

46. (B) Dynamic Host Configuration Protocol (DHCP)
The Dynamic Host Configuration Protocol is a network service that automatically assigns essential settings to devices when they connect to a network. This includes providing an IP address, subnet mask, and default gateway without requiring manual input from the user. This automation simplifies network management and ensures that devices can communicate immediately upon joining a wired or wireless connection.

47. (B) The domain name of the mail server hosting the user's account.
In a standard email address, the part before the "@" symbol identifies the specific user, while the part following it specifies the domain name of the hosting mail server. This domain informs the network where the recipient's mailbox is located so that messages can be correctly routed across the internet. It typically represents the service provider or organization's name.

48. (B) Spiders or Crawlers
Search engines utilize automated programs known as spiders or crawlers to systematically browse the internet and index information. These programs follow links from one page to another, collecting data about the content and structure of each website they visit. This constantly updated index allows search engines to provide relevant results to users almost instantly when a query is performed.

49. (C) V only
Cookies are small text files stored on a user's computer to remember information like login states and preferences. While they can be used for tracking and advertising, they are not executable programs and cannot independently run viruses or malicious code. They act as data storage for the browser and are subject to security policies that prevent them from damaging systems.

50. (A) P-2, Q-4, R-1, S-3
The development of the web is categorized into generations based on functionality. Web 1.0 focused on static, read-only content. Web 2.0 introduced social and interactive features driven by users. Web 3.0 aims for a decentralized, semantic web using blockchain technology. Meanwhile, the dark web refers to unindexed networks that require specific software for access to maintain high levels of anonymity.

51. (D) Adobe Photoshop
Digital collaboration tools like Zoom and Microsoft Teams are designed to facilitate communication and teamwork through video calls, messaging, and file sharing. Adobe Photoshop, however, is a specialized software application used for image editing and graphic design. While it is an essential professional tool, its primary function is not real-time communication or project management between different remote team members.

52. (D) Mosaic
Mosaic was released in 1993 and is credited with making the World Wide Web accessible to the general public by introducing a graphical interface. It allowed images to be displayed inline with text for the first time, transforming the web from a text-based medium into a visual experience. This innovation sparked the rapid growth and popularity of the internet.

53. (C) The practice of overloading a page with keywords to manipulate search engine rankings.
Keyword stuffing is an unethical search engine optimization practice that involves repeating search terms excessively on a webpage. The goal is to manipulate the site's ranking by making it appear more relevant to search engines than it actually is. Because this leads to a poor user experience, modern search algorithms identify and penalize websites that utilize this manipulative technique.

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the identity of the website through certificates, it also protects users from various fraudulent activities.

18. (A) Post Office Protocol (POP3)
Routing protocols like OSPF, BGP, and RIP are used by network devices to determine the best paths for data packets to travel across interconnected networks. However, the Post Office Protocol version 3 is an application-specific protocol designed strictly for retrieving emails from a mail server. It does not play a role in managing the movement of packets between different network nodes.

19. (D) I, II, and III
DNS records are essential for directing different types of internet traffic to the correct destinations. An A record points a domain to an IPv4 address, while AAAA records perform the same function for the newer IPv6 format. Additionally, MX records identify the specific servers responsible for handling email for a domain. Together, these records ensure various services function seamlessly.

20. (A) IPv4 address, MAC address, IPv6 address
Modern networking identifiers utilize different bit lengths, which directly determines the size of their available address spaces. IPv4 uses 32 bits, offering about four billion unique addresses, while MAC addresses consist of 48 bits for hardware identification. IPv6 uses 128 bits, providing a massive expansion of addresses. Therefore, the addresses grow significantly in size from IPv4 to MAC to IPv6.

21. (C) Uploading and downloading files between a client and a server.
The File Transfer Protocol is a standard network protocol used specifically for moving computer files between a client and a server. It allows users to upload content to a web server or download software from a remote repository. While older and often unencrypted, it remains a fundamental tool for managing files across networks through dedicated client software or command-line interfaces.

22. (B) By being broken down into small, distinct packets that are reassembled at the destination.
Internet communication relies on packet switching, where large files are sliced into smaller units called packets. Each packet contains the source and destination addresses and may travel different routes across the network to reach its goal. Once they arrive, the receiving device reassembles them into the original file. This method is highly efficient and resilient against localized network failures or congestion.

23. (D) Fiber Optic
Fiber optic broadband represents a major advancement in telecommunications by using light instead of electricity to transmit data. Laser or LED light pulses travel through thin glass fibers, carrying information at extremely high speeds over very long distances with minimal loss. This technology provides significantly higher bandwidth than traditional copper-based cables and is entirely immune to common forms of electromagnetic interference.

24. (C) Port 80
Network communication relies on specific port numbers to direct traffic to the correct service on a server. Port 80 is the globally recognized default for unencrypted Hypertext Transfer Protocol traffic. When a user enters a standard web address without specifying a port, the browser automatically connects via port 80 to request and receive the webpage data from the host server.

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25. (A) Both Statement I and Statement II are correct.
An IP address is a logical identifier assigned by a network, meaning it can change whenever a device connects to a different router or location. Conversely, the MAC address is a permanent hardware identifier burned into the network interface card during manufacturing. Understanding this distinction is vital, as one identifies the current network location while the other identifies the specific device.

26. (D) It was fundamentally designed to replace the TCP/IP protocol suite.
The World Wide Web was developed as an application that runs on top of the existing internet infrastructure, utilizing the TCP/IP suite rather than replacing it. It introduced concepts like HTML and URLs to make information easily

98. What is the most appropriate reason for the establishment of the National Internet Exchange of India (NIXI)?
(A) To provide a centralized platform for the monitoring and filtering of all international data traffic entering the Indian territory.
(B) To route domestic traffic between ISPs within India directly to reduce latency.
(C) To act as the exclusive Tier 1 Internet Service Provider responsible for delivering residential broadband to all Indian consumers.
(D) To facilitate the indigenous manufacturing of hardware components like high-speed routers and switches for government offices.

99. The ambitious BharatNet project aims to have a significant effect on internet usage statistics in India primarily by doing what?
(A) Providing free mobile 5G smartphones to all citizens.
(B) Banning foreign search engines to promote indigenous platforms.
(C) Replacing all existing copper telephone lines in metropolitan cities with satellite connections.
(D) Connecting all Gram Panchayats in the country with high-speed optical fiber networks.

100. Identify the incorrect statement covering broad internet technology concepts.
(A) IPv6 addresses are 128 bits long and written in hexadecimal format.
(B) Web 3.0 emphasizes decentralized architecture using blockchain technologies.
(C) DNS reduces the need for users to memorize complex numerical IP addresses.
(D) Tor is designed to expose real IP addresses of its users to website owners.

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increasing a website's visibility and authority on the internet.

36. (A) Both Statement I and Statement II are correct.
Video conferencing requires the real-time transmission of large amounts of data, necessitating high bandwidth and extremely low latency to avoid delays. To manage this efficiently, digital codecs compress the audio and video signals before transmission and decompress them upon arrival. These technologies ensure that participants can communicate smoothly without experiencing significant interruptions or degradation in quality during the live session.

37. (A) They prefer to store and synchronize all email messages on the remote mail server.
The Internet Message Access Protocol allows users to access and manage their emails directly on the mail server rather than downloading them to a single device. This ensures that all messages and folder structures remain synchronized across multiple platforms like smartphones and computers. It is the ideal choice for people who need consistent access to their entire mailbox from various locations.

38. (D) Static sites show the same content to everyone, while dynamic sites change per user.
Static websites deliver the same pre-built files to every visitor, making them fast but less interactive. In contrast, dynamic websites use server-side scripts to generate content in real-time based on user behavior or database information. This allows dynamic sites to offer personalized experiences, such as user profiles or shopping carts, which change based on who is accessing the page.

39. (D) A tiny, transparent image used in pages or emails to monitor and track user behavior.
A tracking pixel is a small, often invisible graphic embedded in websites or emails that notifies a server when it is loaded. This allows marketers to gather data on user behavior, such as when an email is opened or which pages are visited. These tools are widely used for digital advertising and analytics to measure the effectiveness of online campaigns.

40. (D) Mozilla Firefox
While Google, Bing, and DuckDuckGo are search engines designed to find information across the internet, Mozilla Firefox is a web browser. A browser is the software application used to access and view websites, whereas search engines are services that index the web. This distinction is important because the browser provides the platform for using various search engine services.

41. (A) I, II, III, and V
Cloud computing offers various service models including IaaS for virtualized hardware, PaaS for development tools, and SaaS for software applications. Hybrid clouds combine private and public resources for greater flexibility. However, a public cloud is available to the general public or large industry groups, whereas a private cloud is dedicated exclusively to a single organization, making that specific statement incorrect.

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42. (C) MAC address
Every network interface controller is assigned a unique Media Access Control address by the manufacturer. This 48-bit identifier serves as the permanent physical address of the device on a local network. Unlike IP addresses, which change based on the network connection, the MAC address remains constant, allowing for the precise identification of hardware during the data link layer communication process.

43. (B) HyperText Markup Language (HTML)
HyperText Markup Language is the foundational language used to create the structure and content of web pages. It uses tags to define elements like headings, paragraphs, links, and images, providing a blueprint for how information is organized. While other languages handle styling or interactivity, this markup language is responsible for the raw data and hierarchical arrangement seen by browsers.

44. (D) The rise of user-generated content, interactive web applications, and social media.
The transition to Web 2.0 represented a shift from static, read-only pages to a more participatory and social internet. This era is defined by the rise of platforms that allow users to create and share their own content, such as blogs and social media. This increased interactivity and

website's original primary hosting server.
(B) They help mitigate Distributed Denial of Service (DDoS) attacks.
(C) They rely heavily on caching static assets like images and stylesheets.
(D) They are widely utilized by major streaming services to ensure smooth video delivery.

83. What is the most appropriate description of a packet-filtering firewall?
(A) It scans the internal data payload of packets to detect and remove malicious viruses.
(B) It acts as a comprehensive intermediary server that hides the internal IP addresses.
(C) It uses built-in encryption to protect outgoihpng data from potential network eavesdropping.
(D) It makes filtering decisions based on header info like source/destination IP and port.

84. Which of the following is a correct statement regarding the Temporary Suspension of Telecom Services (Public Emergency or Public Safety) Rules, 2017 in India?
(A) A shutdown order can only be authorized by the Prime Minister of India.
(B) Services can be suspended indefinitely without any mandatory review system.
(C) A suspension order must be issued by a Home Secretary or a state Secretary.
(D) Rules require that all users receive financial refunds for the offline period.

85. Which global multi-stakeholder organization is responsible for managing the allocation of IP address spaces and the Domain Name System root zone?
(A) World Wide Web Consortium (W3C)
(B) Internet Engineering Task Force (IETF)
(C) Internet Corporation for Assigned Names and Numbers (ICANN)
(D) Institute of Electrical and Electronics Engineers (IEEE)

86. A Content Delivery Network (CDN) primarily accelerates web page load times for users situated globally by applying which core concept?
(A) Forcing all web traffic to funnel through a single, highly powerful central server.
(B) Caching content on dispersed edge servers situated geographically closer to the end users.
(C) Removing all multimedia and styling elements to reduce file sizes to zero.
(D) Dynamically upgrading the end-user's local broadband hardware.

87. Which online privacy threat involves attackers manipulating individuals into voluntarily revealing confidential information through deceptive techniques?
(A) Packet Sniffing
(B) Social Engineering
(C) Port Scanning
(D) DNS Hijacking

88. Identify the correct option after reading the assertion and reason provided below:
Assertion (A): A stateful inspection firewall is generally considered more secure than a basic packet-filtering firewall.
Reason (R): A stateful inspection firewall monitors the active state and context of network connections, rather than simply analyzing individual packets in isolation.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

89. In the absence of strict Net Neutrality regulations, what is a likely potential effect on a new startup streaming service competing against a service owned by an Internet Service Provider (ISP)?
(A) The startup will receive priority routing through high-speed core network protocols.
(B) The startup's service may be throttled or require users to pay the ISP extra fees.
(C) The startup will be mandated to host its application data strictly on the dark web.
(D) The startup's domain registration will be immediately terminated by the ICANN body.

90. The Dark Web is predominantly accessed using specialized routing software known as Tor. What does "Tor" stand for?
(A) The Onion Router
(B) Total Online Routing

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54. (C) Recompiling computer operating system files for faster performance.
HTTP cookies are versatile tools used for maintaining user sessions, storing site preferences, and tracking browsing habits for personalized advertising. They are specifically designed for web-based interactions and do not have the capability to interact with or recompile the computer's underlying operating system. Their function is limited to the browser environment and the specific websites that created them for data management.

55. (C) Statement I is correct, but Statement II is incorrect.
Dynamic websites utilize server-side scripts and databases to provide interactive experiences tailored to individual users. Content Management Systems like WordPress are built specifically to facilitate the creation of these dynamic sites, allowing users to update and manage content without deep technical knowledge. Therefore, the idea that such systems are primarily for building static websites is a misunderstanding of their capabilities.

56. (A) ARP - MAC to IP resolution
The Address Resolution Protocol is used to find the physical MAC address when only the logical IP address is known. The claim that it handles MAC to IP resolution is incorrect, as that specific task is performed by the Reverse Address Resolution Protocol. DNS and DHCP are correctly identified with their roles in domain name translation and dynamic IP address assignment respectively.

57. (A) It converts analog voice signals into digital data packets for transmission over IP networks.
Voice over Internet Protocol is a technology that allows for voice communication over digital networks instead of traditional analog phone lines. It works by converting audio signals into data packets that can be transmitted over the internet using standard IP protocols. This method is often more cost-effective and provides additional features compared to conventional telecommunication services using copper wiring.

58. (B) II, III, and IV
Effective Search Engine Optimization includes ethical practices like building quality backlinks and improving website speed, which are known as off-page and technical SEO. Cloaking, which shows different content to users than to search engines, is a deceptive black hat technique. In contrast, keyword stuffing is not a legitimate practice and is actively penalized by search engines to ensure quality results.

59. (C) Web sessions and cookies
Because HTTP is a stateless protocol, it does not naturally remember information from one request to the next. Web developers use sessions and cookies to create statefulness, allowing a website to track a user's actions, such as keeping items in a shopping cart. These mechanisms store small amounts of data that identify the user as they navigate through different pages.

60. (B) To give users greater control over their data, bypassing centralized platforms.
Web 3.0 represents a shift toward a decentralized internet where data is not controlled by a few large corporations. By utilizing blockchain and peer-to-peer networks, it aims to give users more ownership and control over their personal information and digital assets. This architecture reduces reliance on central authorities, promoting a more transparent and user-centric model for global online interaction.

61. (C) Proxy server
A proxy server sits between a user's device and the internet, acting as a gateway for all outgoing and incoming requests. It can be used to improve performance through caching, provide anonymity by hiding the user's IP address, or enforce security policies by filtering content. By handling requests on behalf of the client, it adds an extra layer of control.

62. (A) That ISPs treat all data equally, without discrimination based on content or user.
Net Neutrality is the principle that all internet traffic should be treated equally by service providers, regardless of its content, source, or destination. This prevents ISPs from slowing down or blocking specific websites and services while prioritizing others. Supporters argue this is necessary to ensure a level playing field for competition and to protect the free exchange of information online.

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63. (A) Buffering
Buffering is a process where a media player preloads a portion of a data stream into a temporary storage area before starting playback. This ensures that the video or audio can continue to play smoothly even if there are minor interruptions or fluctuations in the network connection. It is a common occurrence when the connection speed is slower than required.

64. (A) P-4, Q-1, R-3, S-2
Cybersecurity threats involve various methods to compromise data or services. Phishing uses deception to steal information, while doxxing involves exposing someone's private details publicly. Ransomware encrypts files to demand payment, and DDoS attacks overwhelm servers with traffic to crash them. Understanding these distinct threats is essential for implementing effective digital defenses and protecting personal privacy in an increasingly connected world.

65. (A) Deep Web - Consists of unindexed content like academic databases and private email inboxes.
The Deep Web consists of all parts of the internet that are not indexed by standard search engines, including private databases, medical records, and academic journals. This is distinct from the Dark Web, which is a small subset requiring specific software for access. Most of the information online actually resides in the deep web, hidden behind logins or complex technical barriers.

66. (A) Border Gateway Protocol (BGP)
IoT devices often require specialized, lightweight protocols like MQTT and CoAP because they operate with limited power and bandwidth. These protocols are optimized for small data transfers and intermittent connectivity. However, the Border Gateway Protocol is a complex routing protocol used to manage the exchange of information between large networks on the internet backbone and is not suitable for IoT.

67. (C) They use synchronization agents to mirror local folder states with remote servers.
Cloud storage services function by storing user files on remote servers, which can be accessed from any device with an internet connection. They use software agents to synchronize files across multiple platforms, ensuring that changes made on one device are reflected everywhere. This provides a convenient way to back up data and collaborate on documents without relying on local storage.

68. (D) Statement I is incorrect, but Statement II is correct.
The internet is not owned by any single organization but is managed through a multi-stakeholder model involving various groups. ICANN plays a key role by coordinating the technical management of the Domain Name System and IP address allocation. While the United Nations and governments provide policy input, the actual technical coordination is handled by specialized non-profit entities to ensure global interoperability.

69. (A) Indian Telegraph Act, 1885
The Indian Telegraph Act of 1885 provides the legal framework for the government to regulate telecommunications and intercept messages in the interest of public safety or emergencies. The 2017 rules specifically derived from this act allow for the temporary suspension of telecom services, including the internet. This historical legislation remains a primary tool for managing national security in the digital age.

70. (C) Internet Protocol Security (IPsec)
Internet Protocol Security is a suite of protocols used to secure communication by authenticating and encrypting each IP packet in a data stream. It is a core component of many Virtual Private Networks, providing a secure tunnel for data to travel over public networks. By ensuring confidentiality and integrity, it protects sensitive information from being intercepted or modified during transmission.

71. (A) 5G uses a mix of low, mid, and high-band frequencies for coverage and speed.
5G technology utilizes a broad range of radio frequencies to provide a balance of speed, capacity, and coverage. Low-band frequencies offer wide coverage and wall penetration, while high-band millimeter waves provide extremely fast speeds over short distances. This tiered approach allows mobile operators to meet the diverse needs of users in both crowded urban environments and more sparsely populated rural areas.

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72. (A) P-3, Q-1, R-4, S-2
Various network technologies serve distinct roles in enhancing performance and security. Content Delivery Networks use edge servers to reduce latency, while VPNs provide secure, encrypted tunnels for privacy. Proxy servers act as intermediaries for client requests, and firewalls monitor traffic to prevent unauthorized access. Together, these tools form a comprehensive defense and delivery infrastructure for modern internet-based communications and services.

73. (D) ICANN
Regional Internet Registries are organizations responsible for allocating IP addresses within specific geographic areas, such as APNIC for Asia-Pacific and ARIN for North America. ICANN, however, is the global coordinating body that oversees the entire system and manages the root zone of the DNS. While they work together, ICANN operates at a higher level than the regional registries themselves.

74. (C) The portion of the internet that is not indexed by standard web search engines.
The Deep Web includes all content that is not searchable through standard engines, such as internal company portals, password-protected sites, and subscription-based databases. It is much larger than the visible surface web and contains vast amounts of legitimate but private information. It should not be confused with the dark web, which is specifically designed for anonymity and often requires special software.

75. (D) The network of physical objects embedded with sensors and software that connect and exchange data over the internet.
The Internet of Things describes the growing network of everyday physical objects that are equipped with sensors, software, and connectivity to exchange data. These devices can range from simple household appliances like smart thermostats to complex industrial machinery. By connecting these items to the internet, they can be monitored and controlled remotely, leading to greater efficiency and new automated capabilities.

76. (D) Streaming allows media to be played continuously while it is being delivered, without waiting for the entire file to save locally.
Streaming allows users to begin viewing or listening to media content almost immediately as it is being delivered over the network. Unlike downloading, which requires the entire file to be saved to the device before it can be opened, streaming processes data in real-time. This saves local storage space and provides a more convenient way to consume large multimedia files instantly.

77. (D) Active footprints are user-submitted, whereas passive ones are collected without consent.
An active digital footprint is created when a user intentionally shares information, such as posting on social media or sending an email. In contrast, a passive digital footprint is gathered without the user's direct involvement, often through cookies or tracking pixels that monitor browsing habits. Both contribute to a permanent digital record that can affect a person's privacy and reputation.

78. (D) They provide total anonymity that hides all activity from the VPN provider itself.
Virtual Private Networks enhance privacy by encrypting data and masking IP addresses, making it difficult for third parties to track online activities. However, they do not provide absolute anonymity because the VPN provider itself can still see the user's traffic and connection logs. Users must trust their provider's privacy policies, as they still possess visibility into the encrypted data stream.

79. (C) A is true but R is false.
Zero-rating occurs when an internet provider allows users to access specific websites or services without it counting against their data cap. While this might seem beneficial, it is criticized for violating net neutrality because it creates an unfair advantage for certain content providers. This practice can distort competition by making it harder for new or smaller services to attract users effectively.

80. (B) II, III, I
The internet is structured into layers based on how easily content can be found. The surface web is fully indexed and accessible to anyone using a search engine. Below that, the deep web contains

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98. (B) To route domestic traffic between ISPs within India directly to reduce latency.
NIXI was established to facilitate the peering of internet service providers within India, allowing them to exchange traffic directly rather than routing it through international gateways. This keeps domestic data local, which reduces latency and lowers the cost of internet services for consumers. It is a critical piece of infrastructure that supports the efficiency and performance of the national network.

99. (D) Connecting all Gram Panchayats in the country with high-speed optical fiber networks.
The BharatNet project is a massive initiative to bring high-speed broadband to rural India by laying an extensive network of optical fiber. By connecting hundreds of thousands of Gram Panchayats, it aims to provide the infrastructure needed for e-governance, digital education, and healthcare in remote areas. This is a key part of the government's strategy to bridge the digital divide.

100. (D) Tor is designed to expose real IP addresses of its users to website owners.
Tor is specifically designed to provide anonymity by masking the user's real IP address from the websites they visit. It achieves this by bouncing traffic through three different layers of nodes, making it nearly impossible for the destination to identify the original source. The claim that it exposes IP addresses is the exact opposite of its intended and actual function.

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those of partners who pay for faster delivery. This could result in other services being throttled, leading to slower speeds or extra costs for users. Such a scenario would create significant barriers for new startups, potentially stifling innovation and limiting the choices available to consumers online.

90. (A) The Onion Router
The Onion Router is a specialized system designed to provide high levels of anonymity by routing traffic through multiple layers of encryption and different nodes. Each node only knows the identity of the previous and next hops, preventing any single point from seeing the entire path. This technology is widely used to access the dark web and protect user privacy.

91. (B) National Internet Exchange of India (NIXI)
The National Internet Exchange of India is the organization responsible for managing and operating the registry for .in domain names. It promotes the use of Indian language domains and works to keep domestic internet traffic within the country to improve speeds. By overseeing the national country code extension, it plays a vital role in the growth of India's digital identity.

92. (C) Urban areas exhibit significantly higher penetration than rural areas.
Tele-density and internet penetration in India vary significantly between regions, with urban centers consistently showing much higher rates of access than rural areas. Factors such as infrastructure availability, income levels, and digital literacy contribute to this divide. Addressing this gap is a major goal of national policies aimed at ensuring that the benefits of the digital economy reach all citizens.

93. (D) 4G - Introduction of decentralized blockchain networking
Each generation of mobile networks brought major technical shifts, such as 2G introducing digital voice and 3G enabling mobile data. 4G focused on providing high-speed mobile broadband using LTE technology to support video streaming and modern apps. However, blockchain is a software architecture that is independent of mobile network generations, making its association with 4G technology fundamentally incorrect.

94. (C) A Virtual Private Network (VPN)
Virtual Private Networks create a secure, encrypted connection over public internet infrastructure, making them ideal for remote work. They allow employees to access internal corporate resources as if they were directly connected to the office network. By hiding data from potential eavesdroppers on public Wi-Fi, they provide the necessary security for handling sensitive business information outside the workplace.

95. (A) P-4, Q-1, R-2, S-3
Indian technology organizations each have specific roles, such as CERT-In handling cybersecurity incidents and TRAI regulating the telecom market. NIXI manages internet exchanges and the national domain registry, while BBNL focuses on building infrastructure for rural connectivity through the BharatNet project. Together, these entities form the regulatory and developmental framework for the country's rapidly growing digital ecosystem and telecommunications.

96. (A) Both Statement I and Statement II are correct.
5G deployment often uses a non-standalone architecture that leverages existing 4G infrastructure for faster initial rollout. In contrast, standalone architecture utilizes a completely new core network specifically designed for 5G, enabling advanced features like network slicing and ultra-low latency. Both approaches are part of the global transition to next-generation mobile connectivity, offering different paths for network operators to follow.

97. (A) eMBB (Enhanced Mobile Broadband) - Focuses on incredibly high data rates for applications like virtual reality.
The International Telecommunication Union defines eMBB as a core capability of 5G, focusing on delivering significantly higher data speeds for consumers. This supports bandwidth-intensive applications such as high-definition video streaming and augmented reality. By providing a more powerful and faster connection, it enhances the overall mobile experience for users who require large amounts of data on the go.

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connection between paired devices
(D) Telegram does not store any messages on servers once they are delivered

10. Which of the following is a key characteristic of the fediverse, an emerging concept in social networking?
(A) A single global corporation maintains centralized control over all user data
(B) It restricts all registered users to text-only communication without media support
(C) It consists of decentralized, interconnected servers allowing cross-platform interaction
(D) It requires users to pay a mandatory monthly fee to access publishing tools

11. Arrange the following digital communication formats in the general chronological order of their widespread emergence on the internet:
I. Weblogs (Blogs)
II. Bulletin Board Systems (BBS)
III. Modern Social Networking (e.g., Facebook)
IV. Short-form algorithmic video (e.g., TikTok)
Select the correct order:
(A) I, II, III, IV
(B) II, I, III, IV
(C) II, III, I, IV
(D) I, III, II, IV

12. Which popular social media platform was originally developed under the codename Twttr?
(A) Tumblr
(B) Threads
(C) Twitter
(D) Telegram

13. An organization wants to run a social media campaign exclusively targeting corporate executives and human resource managers. Which platform is the most appropriate choice?
(A) LinkedIn
(B) Snapchat
(C) Pinterest
(D) ShareChat

14. Which feature was introduced by Instagram specifically to compete with the rising popularity of the short-video platform TikTok?
(A) Stories
(B) IGTV
(C) Reels
(D) Carousels

15. What is the primary privacy benefit of an application using end-to-end encrypted messaging?
(A) It hides the user's IP address from the internet service provider and websites
(B) It ensures the user's phone number cannot be seen by any saved contacts
(C) It automatically deletes the application if the mobile hardware is stolen
(D) It prevents service providers and hackers from reading message contents

16. The transition to Web 2.0 was crucial for the evolution of social media primarily because it introduced which of the following features?
(A) User-generated content and interactivity
(B) Static web pages and one-way browsing
(C) Dial-up speeds and limited connectivity
(D) Server-side scripts and closed databases

17. Which Indian microblogging platform was launched in 2020 as a domestic alternative to Twitter, featuring a yellow bird as its logo?
(A) Koo
(B) Chingari
(C) ShareChat
(D) Mitron

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18. Find the odd one out among the following digital communication platforms based on their primary functionality.
(A) Wikipedia
(B) WhatsApp
(C) Telegram
(D) Signal

19. Which of the following provides the correct chronological sequence of the global public launch of these major social media platforms, from earliest to latest?
(A) Facebook → LinkedIn → Twitter → Instagram
(B) LinkedIn → Facebook → Twitter → Instagram
(C) Twitter → LinkedIn → Facebook → Instagram
(D) LinkedIn → Twitter → Facebook → Instagram

CHAPTER 18
Social Networking and Digital Platforms

1. The rapid proliferation of social networking worldwide during the 2010s was most directly caused by which of the following technological advancements?
(A) The invention and initial mass-marketing of the personal home computer
(B) The development and public release of early algorithmic search engines
(C) The introduction of satellite television and high-frequency radio broadcasting
(D) The widespread adoption of smartphones and mobile broadband internet

2. Instagram originally gained massive popularity primarily due to which built-in capability?
(A) Facilitating disappearing text messages between anonymous groups
(B) Providing end-to-end encrypted group calls for secure business use
(C) Offering extensive photo filters to enhance mobile photography
(D) Professional resume hosting and automated recruitment for corporations

3. In the context of digital platforms, which of the following best defines an asynchronous communication platform?
(A) A platform requiring all participating parties to stay online simultaneously
(B) A digital system dedicated exclusively to high-definition live video streaming
(C) A system allowing users to consume and respond to content at their convenience
(D) A legacy communication tool that only permits synchronous real-time voice calls

4. What is the primary target demographic strategy of the Indian social media platform ShareChat?
(A) English-speaking corporate professionals and global academic researchers
(B) International tourists visiting India and seeking local guide services
(C) Users communicating primarily in various Indian regional languages
(D) Scientific researchers publishing peer-reviewed studies on social trends

5. Facebook's algorithm that determines what content appears on a user's feed was originally famously known as which of the following?
(A) PageRank
(B) EdgeRank
(C) News Feed
(D) TrustRank

6. The WhatsApp Pay feature in India operates on top of which domestic digital payment interface?
(A) NEFT
(B) UPI
(C) RTGS
(D) IMPS

7. Which of the following is widely considered the first recognizable social media networking site, launched in 1997?
(A) MySpace
(B) SixDegrees
(C) Friendster
(D) Orkut

8. To combat misinformation, Twitter (now X) introduced a feature that allows users to collaboratively add context to potentially misleading posts. What is this feature called?
(A) Fact Checkers
(B) Community Notes
(C) Truth Flags
(D) Context Bubbles

9. Which architectural feature distinguishes Telegram from WhatsApp regarding message storage?
(A) Telegram stores all chat history exclusively on local user devices
(B) Telegram uses cloud-based storage for seamless multi-device synchronization
(C) Telegram requires a constant Bluetooth

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unindexed but mostly legitimate private data. The dark web is the most hidden layer, requiring specific tools to access and offering high levels of anonymity for its users.

81. (C) Internet of Things (IoT)
Smart home devices like security cameras represent the Internet of Things in action, where physical hardware uses connectivity to provide remote services. These systems collect data through sensors and transmit it to cloud servers for processing and storage. This allows users to interact with their homes from anywhere, demonstrating how embedded technology can enhance daily life through internet connectivity.

82. (A) They permanently replace the need for the website's original primary hosting server.
Content Delivery Networks improve website performance by storing copies of static content on a global network of servers. While they greatly enhance speed and reliability, they do not replace the primary hosting server where the original files and databases are maintained. The CDN acts as a distribution layer, ensuring that users receive data from a location that is geographically closer to them.

83. (D) It makes filtering decisions based on header info like source/destination IP and port.
A packet-filtering firewall is a security tool that examines the header of each incoming and outgoing data packet. It makes decisions to allow or block traffic based on predefined rules, such as source IP addresses, destination ports, and protocol types. This basic level of security is efficient and provides a fundamental defense against unauthorized access to a private network.

84. (C) A suspension order must be issued by a Home Secretary or a state Secretary.
In India, the authority to order an internet shutdown is vested in the Home Secretary of the central or state government. These orders are issued under specific rules to maintain public order or during emergencies. The process includes a mandatory review by a committee to ensure the suspension is necessary and proportionate, reflecting the legal balance between security and communication rights.

85. (C) Internet Corporation for Assigned Names and Numbers (ICANN)
The Internet Corporation for Assigned Names and Numbers is a global non-profit organization that coordinates the technical management of the internet's most critical systems. This includes overseeing the allocation of IP addresses and managing the top-level domain names. By maintaining these shared resources, it ensures that the internet remains a stable, secure, and interoperable network for everyone worldwide.

86. (B) Caching content on dispersed edge servers situated geographically closer to the end users.
CDNs reduce the physical distance data must travel by placing edge servers in various locations around the world. When a user requests a webpage, the network delivers the content from the nearest server rather than the original source. This significantly decreases latency and load times, providing a smoother experience for users regardless of their actual distance from the main server.

87. (B) Social Engineering
Social engineering is a psychological manipulation technique used by attackers to trick people into giving away confidential information or performing actions that compromise security. Unlike technical hacks, it exploits human nature and trust through methods like phishing or impersonation. Education and skepticism are the primary defenses against these types of attacks, as they target individuals rather than software vulnerabilities.

88. (A) Both A and R are true and R is the correct explanation of A.
Stateful inspection firewalls are more advanced than basic packet filters because they track the history and context of network connections. By remembering the state of active sessions, they can distinguish between legitimate responses to internal requests and unauthorized external probes. This contextual awareness provides a significantly higher level of security, as it prevents many types of common network-based attacks.

89. (B) The startup's service may be throttled or require users to pay the ISP extra fees.
Without net neutrality protections, internet providers could prioritize their own services or

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20. What is the primary function of YouTube's Content ID system?
(A) To automatically manage and identify copyright-protected material
(B) To recommend viral videos based on individual user watch history
(C) To verify the legal identity and age of professional content creators
(D) To translate video subtitles into different languages for global reach

21. A business wants to set up an automated system to respond to customer queries inside a messaging app without human intervention. Which feature is most appropriate?
(A) WhatsApp Status
(B) Instagram Reels
(C) Telegram Bots
(D) Facebook Stories

22. Which of the following statements correctly differentiates social networking platforms from traditional mass media?
(A) Social networking platforms rely primarily on traditional one-way communication flows
(B) Social networking platforms facilitate multi-directional communication and content creation
(C) Traditional mass media outlets allow for immediate and decentralized user feedback loops
(D) Traditional mass media depends almost entirely on user-generated and shared content files

23. In 2021, the parent company of Facebook officially changed its name to reflect its new focus on immersive virtual experiences. What is the new name?
(A) Alphabet
(B) Omniverse
(C) Horizon
(D) Meta

24. Telegram is frequently used for digital activism and large community broadcasts primarily because it allows channels with up to how many subscribers?
(A) 256
(B) 100,000
(C) 200,000
(D) Unlimited

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25. Which of the following best describes the primary use case of the LinkedIn platform?
(A) Hosting anonymous imageboard discussions on niche subcultures
(B) Professional networking and career development for the workforce
(C) Distributing ephemeral video messages among teenage demographics
(D) Organizing large-scale multiplayer competitive online gaming tournaments

26. Which of the following features is the defining characteristic of a microblogging platform compared to a traditional blogging platform?
(A) It requires a mandatory paid subscription to publish any original content
(B) It restricts the platform functionality to audio file uploads and playback
(C) It lacks any technical support for external hyperlinks or embedded media
(D) It enforces strict limits on the character count of individual posts

27. Identify the incorrect pair of instant messaging application and its parent company.
(A) Signal - Microsoft
(B) WhatsApp - Meta
(C) Telegram - Telegram FZ-LLC
(D) iMessage - Apple

28. Match the social media platforms in List I with their primary platform types in List II:
List I: (Social Media Platform)
P. LinkedIn
Q. Instagram
R. YouTube
S. Twitter
List II: (Primary Platform Type)
1. Video Sharing
2. Professional Networking
3. Microblogging
4. Visual Content Sharing
(A) P-2, Q-4, R-1, S-3
(B) P-4, Q-2, R-3, S-1
(C) P-2, Q-1, R-4, S-3
(D) P-3, Q-4, R-1, S-2

29. WhatsApp relies on which encryption protocol to provide end-to-end encryption for its users?
(A) RSA 2048 Protocol
(B) OpenPGP Protocol
(C) Signal Protocol
(D) BitLocker Protocol

30. Which major technology company acquired the video-sharing platform YouTube in 2006?
(A) Microsoft
(B) Yahoo
(C) Meta
(D) Google

31. The practice of regularly posting short videos documenting one's daily life or opinions on a platform like YouTube is known as what?
(A) Podcasting
(B) Microblogging
(C) Vlogging
(D) Threading

32. In digital marketing metrics, what does CTR stand for?
(A) Content Tracing Rate
(B) Click-Through Rate
(C) Cost To Reach
(D) Consumer Trust Ratio

33. Reddit is a prime modern example of which type of digital platform?
(A) A centralized microblogging network for celebrities
(B) An online forum and community message board system
(C) An encrypted peer-to-peer messaging application for privacy
(D) A platform dedicated to pure visual content sharing only

34. Which of the following scenarios is an explicit example of cyberbullying?
(A) A company sending promotional emails to a subscribed user's inbox
(B) A news organization posting a critical review of a new movie release
(C) Two users respectfully debating political theories on a public forum
(D) Using fake profiles to repeatedly harass or threaten other individuals

35. Which of the following best defines a social media recommendation algorithm?
(A) A mathematical set of rules determining how content is ranked for users
(B) A human editorial team that handpicks every single post seen by the public
(C) The legal framework governing the operation of a global social media site
(D) The physical server infrastructure used to store encrypted user passwords

36. Social media addiction is frequently linked by psychologists to the continuous release of which neurotransmitter, driven by notifications and likes?
(A) Dopamine
(B) Serotonin
(C) Melatonin
(D) Cortisol

37. Which technology is traditionally essential for distributing podcasts to listeners allowing them to subscribe and automatically receive new episodes?
(A) RSS (Really Simple Syndication)
(B) HTML5
(C) FTP (File Transfer Protocol)
(D) SMTP

38. In the context of digital marketing, an individual on social media who has a relatively small (e.g., 1,000 to 10,000) but highly engaged and niche audience is referred to as a:
(A) Mega-influencer
(B) Celebrity influencer
(C) Macro-influencer
(D) Nano-influencer

39. What is the primary goal of media literacy programs in the context of digital platforms?
(A) To train general users to write complex computer code for web apps
(B) To increase the average daily screen time of younger internet users
(C) To help users bypass digital paywalls for premium news and media
(D) To help users critically evaluate the credibility of online information

40. In online forums and community platforms, what is the title given to individuals who have

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the authority to edit, delete, and manage user content to enforce rules?
(A) Influencers
(B) Lurkers
(C) Avatars
(D) Moderators

41. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): End-to-end encryption in instant messaging platforms prevents the platform provider from reading user messages.
Reason (R): End-to-end encryption works by storing the decryption key exclusively on the platform's central servers.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

42. Wikipedia, the world's largest collaborative knowledge platform, runs on which free and open-source software?
(A) WordPress
(B) Drupal
(C) MediaWiki
(D) Joomla

43. In social media advertising, a targeting tool that allows advertisers to reach new people who share similar characteristics with their existing customers is called a:
(A) Excluded Audience
(B) Lookalike Audience
(C) Blocked Audience
(D) Shadow Audience

44. An environment on social media where a user encounters only information and opinions that reflect and reinforce their own beliefs is called what?
(A) A viral loop
(B) An echo chamber
(C) A spatial web
(D) A shadowban

45. Which of the following is an established independent fact-checking organization operating in India to combat fake news?
(A) WhatsApp
(B) ShareChat
(C) Alt News
(D) NITI Aayog

46. Which of the following is the fundamental characteristic of a Wiki platform, such as Wikipedia?
(A) Content is locked and can only be edited by the verified site owner
(B) It allows collaborative modification of content and site structure via browsers
(C) It deletes all user-generated content after a rolling 24-hour period
(D) It requires users to link their government-issued ID for participation

47. In the study of social media addiction and mental health, what does the acronym FOMO stand for?
(A) Frequency Of Media Output
(B) Fear Of Missing Out
(C) False Online Marketing Offers
(D) Fear Of Meaningless Opinions

48. Audio platforms like Spotify and Apple Podcasts have popularized a digital medium consisting of episodic spoken-word audio files. What is this medium called?
(A) Vodcast
(B) Podcast
(C) Webcast
(D) Screencast

49. Read the following statements regarding Influencer Culture and Digital Marketing:
I. Influencer marketing relies heavily on the psychological principle of social proof.
II. Nano-influencers typically demonstrate higher audience engagement rates than mega-influencers.
III. The Advertising Standards Council of India (ASCI) guidelines mandate that influencers must explicitly disclose promotional content.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only

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18. (A) Wikipedia
While the other listed services are primarily designed for private or group instant messaging and real-time communication, this platform functions as a collaborative online encyclopedia. Its core purpose is the collective documentation of knowledge through a community-edited wiki system. This fundamental difference in utility and structure distinguishes it from tools intended for direct interpersonal digital correspondence.

19. (B) LinkedIn → Facebook → Twitter → Instagram
The timeline of major social platforms shows professional networking appearing first in the early 2000s, followed shortly by the launch of general social networking. Microblogging services gained traction a few years later, while mobile-first visual sharing platforms emerged towards the end of the decade. Understanding this sequence highlights how digital interaction styles have evolved over twenty years.

20. (A) To automatically manage and identify copyright-protected material
This sophisticated automated system allows rights holders to identify and manage their copyrighted material across the video-sharing platform. When a video is uploaded, it is compared against a vast database of files submitted by owners. This technology enables creators to either block, track, or monetize their content when it is used without explicit permission by other users.

21. (C) Telegram Bots
To streamline customer service and provide instant responses without human staff, businesses utilize automated software programs integrated into messaging platforms. These specialized applications can handle complex tasks, answer frequent queries, and process transactions through predefined logic. Such tools are highly effective for maintaining constant availability and improving operational efficiency in a digital-first business environment.

22. (B) Social networking platforms facilitate multi-directional communication and content creation
Modern digital networks differ from traditional broadcasting by enabling a decentralized flow of information where every user can be both a consumer and a creator. While older media forms typically distribute content from a single source to a wide audience, these platforms foster multi-directional dialogue. This interactivity allows for real-time feedback and the rapid spread of user-generated content.

23. (D) Meta
In a significant rebranding move, the parent organization of several major social applications adopted a new identity to signal its long-term commitment to the metaverse. This name reflects a strategic pivot toward developing immersive virtual environments and augmented reality technologies. The change underscores the company's vision of moving beyond traditional mobile apps toward the next frontier of digital social interaction.

24. (D) Unlimited
Unlike traditional group chats that have strict caps on the number of participants, certain broadcasting tools on this platform allow for an infinite number of subscribers. This feature makes it an ideal medium for large-scale information dissemination, activism, and community outreach. It enables a single source to reach a massive audience simultaneously without the limitations found in other messaging services.

25. (B) Professional networking and career development for the workforce
This platform is primarily dedicated to the global workforce, serving as a hub for professional identity and career advancement. Users utilize the service to showcase their skills, connect with industry peers, and discover new employment opportunities. By focusing on professional relationships rather than casual social interactions, it has become an official tool for recruitment and corporate networking worldwide.

26. (D) It enforces strict limits on the character count of individual posts
The defining aspect of this specific digital medium is the requirement for brevity in communication. By enforcing strict constraints on the length of individual updates, the platform encourages real-time sharing and rapid information consumption. This differentiates it from traditional blogging, which typically accommodates long-form articles

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4. Short text updates with character limits

(A) P-2, Q-4, R-3, S-1
(B) P-4, Q-2, R-1, S-3
(C) P-2, Q-3, R-4, S-1
(D) P-3, Q-1, R-2, S-4

59. Synthetic media in which a person in an existing image or video is replaced with someone else's likeness using artificial intelligence is known as what?
(A) Phishing
(B) Astroturfing
(C) Deepfake
(D) Doxxing

60. The term "Filter Bubble", which describes the intellectual isolation caused by personalized search and social media algorithms, was coined by whom?
(A) Mark Zuckerberg
(B) Eli Pariser
(C) Tim Berners-Lee
(D) Neal Stephenson

61. The systematic extraction of patterns, anomalies, and correlations from massive social media datasets to predict user behavior is called:
(A) End-to-end encryption
(B) Spatial computing
(C) Data mining
(D) Grid computing

62. Arrange the following levels of grievance escalation for social media users in India under the amended IT Rules framework, from the first point of contact to the final judicial remedy:
I. Grievance Appellate Committee (GAC)
II. Judicial Courts
III. Platform's Resident Grievance Officer
Select the correct order:
(A) III → I → II
(B) I → III → II
(C) III → II → I
(D) I → II → III

63. The controversy surrounding Facebook's Free Basics program in India was primarily centered on its violation of which core internet principle?
(A) Net Neutrality
(B) End-to-end Encryption
(C) Right to be Forgotten
(D) Open Source Licensing

64. Match the appointed personnel or bodies under the IT Rules 2021 in List I with their key functions in List II:
List I: (Appointed Personnel/Body)
P. Chief Compliance Officer
Q. Nodal Contact Person
R. Resident Grievance Officer
S. Grievance Appellate Committee
List II: (Key Function)
1. Hears appeals against intermediary moderation decisions
2. Ensures overall compliance with the IT Act and Rules
3. Provides 24x7 coordination with law enforcement agencies
4. Acknowledges and resolves user complaints directly
(A) P-3, Q-2, R-1, S-4
(B) P-4, Q-1, R-3, S-2
(C) P-2, Q-3, R-4, S-1
(D) P-2, Q-4, R-3, S-1

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65. Under the IT Rules 2021, a social media platform is classified as a "Significant Social Media Intermediary" (SSMI) in India if it has a registered user base exceeding what threshold?
(A) 50 lakh users
(B) 10 lakh users
(C) 25 lakh users
(D) 1 crore users

66. When intelligence agencies or researchers analyze publicly available social media posts, videos, and network connections to gather actionable intelligence, what is this discipline called?
(A) OSINT (Open Source Intelligence)
(B) SIGINT (Signals Intelligence)
(C) HUMINT (Human Intelligence)
(D) IMINT (Imagery Intelligence)

67. The Cambridge Analytica data scandal involved the unauthorized harvesting of data from millions of users on which major platform?
(A) Twitter
(B) YouTube
(C) Facebook
(D) LinkedIn

ANSWERS

1. (D) The widespread adoption of smartphones and mobile broadband internet
The massive expansion of social media usage during the second decade of the twenty-first century was primarily fueled by the ubiquity of high-speed mobile internet and advanced mobile devices. This shift allowed individuals to access platforms constantly from any location, moving beyond the limitations of stationary personal computers and traditional wired connections.

2. (C) Offering extensive photo filters to enhance mobile photography
This platform initially stood out by democratizing high-quality mobile photography through the use of artistic digital enhancements. By allowing users to easily transform ordinary snapshots into visually appealing images, it created a unique niche centered on visual aesthetics. This focus on creative expression through filters became the cornerstone of its rapid growth and widespread user adoption.

3. (C) A system allowing users to consume and respond to content at their convenience
Digital communication is categorized as asynchronous when it does not require participants to be present or active at the same time. This system enables users to post messages or content that others can view and reply to at a later time. Such flexibility is a defining feature of forums, emails, and most modern social media interactions.

4. (C) Users communicating primarily in various Indian regional languages
This specific Indian digital platform focuses on serving the diverse linguistic needs of the domestic population by prioritizing content in regional dialects. By catering to non-English speakers, it addresses a significant market gap in the social media landscape. This strategy effectively connects millions of users through culturally relevant content and communication in their native mother tongues.

5. (B) EdgeRank
The early system used to organize and prioritize content on the social platform's main display was known by a specific technical name. This algorithm evaluated the importance of posts based on factors like user affinity, weight of the interaction, and time decay. It fundamentally shaped how users experienced their social feeds before transitioning to more complex machine learning models.

6. (B) UPI
The integration of financial services within this messaging application relies on the Unified Payments Interface, which facilitates real-time fund transfers between bank accounts. By utilizing this robust domestic infrastructure, the platform enables users to send and receive money as easily as sending a text. This development has significantly contributed to the growth of digital payments in India.

7. (B) SixDegrees
Launched in the late nineties, this platform is widely recognized by digital historians as the first true social networking site. It pioneered the ability for users to create personal profiles and list their connections, embodying the theory that everyone is linked by a small number of intermediaries. This historical service paved the architectural way for all subsequent networking platforms.

8. (B) Community Notes
To enhance information accuracy, the platform implemented a collaborative feature where contributors can add helpful context to potentially misleading posts. This crowdsourced approach empowers the community to provide diverse perspectives and verify facts directly on the platform. By leveraging the collective knowledge of users, the system aims to reduce the spread of misinformation through transparent and public annotations.

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(B) India
(C) Australia
(D) European Union

77. Which national nodal agency in India is responsible for responding to computer security incidents and tracking major cyber threats, often collaborating with social media platforms during crises?
(A) TRAI (Telecom Regulatory Authority of India)
(B) NITI Aayog
(C) ED (Enforcement Directorate)
(D) CERT-In (Computer Emergency Response Team - India)

78. The legal concept that allows individuals to request search engines and social media platforms to remove outdated or irrelevant personal information from public access is known as the:
(A) Right to Information
(B) Right to Privacy
(C) Right to Equality
(D) Right to be Forgotten

79. Which of the following represents the most appropriate sequence for the standard content moderation process on a major digital platform when dealing with a user violation?
(A) Content Removal → User Appeal → Automated/Human Moderation → User Report
(B) User Report → Automated/Human Moderation → Content Action/Warning → User Appeal
(C) User Appeal → User Report → Content Action/Warning → Automated/Human Moderation
(D) Automated/Human Moderation → User Appeal → User Report → Content Removal

80. Significant Social Media Intermediaries (SSMIs) under the IT Rules 2021 are required to publish a compliance report detailing complaints received and actions taken. How often must this report be published?
(A) Weekly
(B) Monthly
(C) Quarterly
(D) Annually

81. The term used to criticize digital activism that requires minimal effort (such as liking a post or changing a profile picture) and has little real-world impact is:
(A) Astroturfing
(B) Hacktivism
(C) Slacktivism
(D) Cyberterrorism

82. When a social media platform deliberately restricts the visibility of a user's content without notifying the user, this practice is commonly known as:
(A) Shadowbanning
(B) Phishing
(C) Doxxing
(D) White-listing

83. In India, the comprehensive regulations governing social media platforms introduced in 2021 are officially known as:
(A) The Personal Data Protection Act, 2021
(B) The Social Media Regulation Act, 2021
(C) The Digital India Act, 2021
(D) The Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021

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84. After acknowledging a standard user complaint, what is the maximum time frame allowed for the Grievance Officer to resolve the issue under the IT Rules 2021?
(A) 3 days
(B) 7 days
(C) 15 days
(D) 30 days

85. What is the immediate legal consequence for a social media intermediary in India if it fails to comply with the obligations outlined in the IT Rules 2021?
(A) The platform is permanently banned from operating within the country
(B) The platform's global CEO is immediately arrested by federal police
(C) The platform loses its safe harbor immunity for user-generated content
(D) The platform must pay a fixed fine of ₹100 crores to the national bank

(C) I and III only
(D) I, II, and III

50. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Social media algorithms frequently contribute to the creation of echo chambers for their users.
Reason (R): Recommendation algorithms prioritize content that aligns with users' past behavior and preferences in order to maximize engagement.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

51. The primary intent of online trolling is generally to:
(A) Provide constructive feedback to content creators regarding their work
(B) Ensure strict compliance with platform-wide community guidelines
(C) Raise funds for charitable causes through viral social awareness
(D) Deliberately provoke, upset, or elicit angry responses from others

52. What is the primary functional difference between a traditional blog and a microblog?
(A) Traditional blogs require video, while microblogs focus exclusively on text
(B) Traditional blogs are mobile-only, while microblogs are for desktop users
(C) Traditional blogs do not allow comments or any form of public interaction
(D) Traditional blogs allow long-form content while microblogs enforce brevity

53. In social media content curation, what is the primary purpose of a hashtag (#)?
(A) To securely encrypt the message for private transmission
(B) To mention another user directly within a public thread
(C) To categorize content and improve discovery across the platform
(D) To automatically delete the post after a pre-determined time

54. The malicious act of publicly revealing private, identifying information about an individual on the internet, typically with malicious intent, is called:
(A) Spamming
(B) Phishing
(C) Doxxing
(D) Spoofing

55. What is the main advantage for a brand relying on User-Generated Content (UGC) for its social media marketing strategy?
(A) It appears more authentic and builds higher trust among consumers
(B) It guarantees total legal ownership of the content by the brand
(C) It ensures the content uses professional, high-end studio equipment
(D) It completely prevents negative reviews from ever being posted online

56. What is the standard format in which posts are typically displayed on a traditional blog?
(A) Reverse chronological order
(B) Chronological order
(C) Alphabetical order by title
(D) Random order generated by algorithms

57. The deceptive practice of presenting an orchestrated marketing or public relations campaign to look like spontaneous grassroots user engagement is known as:
(A) Astroturfing
(B) Crowdsourcing
(C) Fact-checking
(D) Vlogging

58. Match the concepts in List I with their descriptions in List II:
List I: (Concept)
P. Podcasting
Q. Microblogging
R. Wiki
S. Forum
List II: (Description)
1. Threaded community discussions
2. Audio syndication and episodic listening
3. Collaborative knowledge creation

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3. Microblogging (Twitter equivalent)
4. Regional Language Social Network

(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-2, R-4, S-1
(C) P-3, Q-4, R-2, S-1
(D) P-2, Q-4, R-3, S-1

95. Read the following statements regarding the EU Digital Services Act (DSA):

I. It applies uniformly across all member states of the European Union.
II. It mandates a complete ban on targeted advertising directed at minors.
III. It forces platforms designated as "Very Large Online Platforms" to undergo independent risk audits.
IV. It was formulated and enacted by the United Nations.

Which of the above statement(s) is/are correct?
(A) I and III only
(B) I, II, and III only
(C) II, III, and IV only
(D) I, II, III, and IV

96. The ability of users to send messages seamlessly from one social media app (like WhatsApp) to a completely different platform (like Telegram) is a future regulatory goal referred to as:
(A) End-to-end encryption
(B) Interoperability
(C) Data Localization
(D) Zero-rating

97. Read the following statements concerning the Metaverse as a future social networking space:

I. It envisions a 3D, persistent, and immersive virtual environment.
II. It relies heavily on Augmented Reality (AR) and Virtual Reality (VR) technologies.
III. Users are primarily represented by digital avatars within the space.
IV. Its economic systems are often linked to cryptocurrencies and Non-Fungible Tokens (NFTs).
V. It is currently built and strictly controlled by a single central global authority.

Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) I, III, and V only
(C) I, II, III, and IV only
(D) I, II, III, IV, and V

98. In the context of the Metaverse, what is the primary distinction between Virtual Reality (VR) and Augmented Reality (AR)?
(A) VR overlays digital elements onto the real world, while AR immerses the user in a fully enclosed digital environment
(B) VR immerses the user in a fully enclosed digital environment, while AR overlays digital elements onto the real world
(C) VR does not require a headset, while AR can only be experienced with a headset
(D) VR is exclusively for gaming, while AR is exclusively for industrial use

99. In discussions regarding the future evolution of digital platforms, what does Web3 fundamentally advocate for social networking?
(A) A return to static, read-only web pages without any user interaction
(B) Total centralization of social media under a single global government
(C) The complete elimination of all online advertising and paid services
(D) Decentralization using blockchain technology to give users data ownership

100. Match the social media regulations or acts in List I with their respective countries or regions in List II:

List I: (Social Media Regulation/Act)
P. Digital Services Act (DSA)
Q. IT Rules 2021
R. Section 230 of the Communications Decency Act
S. eSafety Commissioner Framework

List II: (Respective Country/Region)
1. Australia
2. United States
3. India
4. European Union

(A) P-3, Q-4, R-1, S-2
(B) P-4, Q-3, R-1, S-2
(C) P-2, Q-3, R-4, S-1
(D) P-4, Q-3, R-2, S-1

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68. Which section of the Indian Information Technology Act, 2000 provides "safe harbor" protection to social media intermediaries, shielding them from liability for third-party user content?
(A) Section 43A
(B) Section 79
(C) Section 66A
(D) Section 69A

69. Under the IT Rules 2021, what is the maximum time limit within which a Resident Grievance Officer must acknowledge a complaint from a user?
(A) 24 hours
(B) 12 hours
(C) 48 hours
(D) 72 hours

70. When a social networking algorithm's sorting parameters systematically disadvantage a particular political viewpoint or demographic, it is an example of:
(A) Algorithmic neutrality
(B) Open source routing
(C) Algorithmic bias
(D) Cryptographic hashing

71. Read the following statements regarding digital activism and citizen journalism:
I. Citizen journalism relies exclusively on government-accredited professional reporters for content creation.
II. Hashtag activism can effectively bypass traditional media gatekeepers to highlight marginalized issues.
III. Digital activism has fundamentally no capacity to influence real-world government policy or corporate behavior.
Which of the above statement(s) is/are INCORRECT?
(A) I only
(B) II only
(C) I and III only
(D) II and III only

72. How do political campaigns most effectively utilize social media during modern elections?
(A) By sending physical mailers and pamphlets to registered voters' homes
(B) By using data analytics for specific micro-targeting of voter groups
(C) By completely replacing electronic voting machines with online polls
(D) By shutting down competitor websites via distributed denial of service

73. Read the following statements regarding the compliance requirements for a Significant Social Media Intermediary (SSMI) under the IT Rules 2021:
I. It must appoint a Chief Compliance Officer.
II. It must appoint a Nodal Contact Person for 24x7 coordination with law enforcement.
III. It must appoint a Resident Grievance Officer.
IV. All these appointed personnel must be residents of India.
V. The platform must have a physical contact address published in India.
Which of the above statement(s) is/are correct?
(A) I, III, and V only
(B) I, II, III, and IV only
(C) II, IV, and V only
(D) I, II, III, IV, and V

74. Which highly debated provision in the IT Rules 2021 mandates that instant messaging apps must be able to identify the first originator of a specific message if required by a court order?
(A) Data Localization
(B) Interoperability
(C) Traceability
(D) Shadowbanning

75. The Arab Spring movement is widely cited in academic studies as a historic example of social media enabling which phenomenon?
(A) Algorithmic bias within automated news feed recommendation systems
(B) E-commerce integration for small businesses during periods of unrest
(C) Cryptocurrency adoption for international cross-border transactions
(D) Digital activism and citizen journalism during major political shifts

76. The stringent General Data Protection Regulation (GDPR), which vastly changed how social media platforms handle user privacy, originated in which jurisdiction?
(A) United States

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9. (B) Telegram uses cloud-based storage for seamless multi-device synchronization
The primary architectural difference lies in how data is managed across multiple devices. One system utilizes a cloud-centric model where messages and media are stored on remote servers, allowing for instantaneous synchronization without needing a primary phone to be online. This contrast stands against local storage models that depend on device-to-device encryption for historical data access and backup.

10. (C) It consists of decentralized, interconnected servers allowing cross-platform interaction
The fediverse represents a conceptual shift toward a decentralized network of independent servers that communicate using common protocols. Unlike centralized platforms owned by single entities, this architecture allows users on different hosting services to interact seamlessly. This model promotes greater user autonomy, data portability, and resistance to singular corporate control within the broader digital social ecosystem.

11. (B) II, I, III, IV
The evolution of digital communication began with early text-based bulletin board systems used in the pre-web era. This was followed by the rise of personal journals and weblogs in the late nineties. Modern social networking sites emerged in the mid-2000s, while highly algorithmic short-form video platforms represent the most recent significant shift in global internet content consumption.

12. (C) Twitter
During its initial development phase, the famous microblogging service was referred to by a shortened, vowel-less codename. This naming convention was popular in early tech startups and reflected the platform's focus on brief, status-based updates. The project eventually evolved into the globally recognized service that redefined real-time communication and public discourse through short, rapid-fire text messages.

13. (A) LinkedIn
For organizations seeking to engage with professionals, recruiters, and industry leaders, this platform serves as the premier digital environment. Its structural design and user demographics are specifically tailored toward career advancement, business networking, and professional development. This makes it the most effective tool for targeted marketing campaigns aimed at the corporate sector and human resource management.

14. (C) Reels
To address the shifting preferences of younger audiences and compete with emerging short-video formats, this visual platform introduced a dedicated feature for creative, multi-clip videos. These short, engaging clips often feature music and special effects, allowing for viral discovery beyond a user's immediate followers. This strategic addition was essential for maintaining user engagement in a highly competitive market.

15. (D) It prevents service providers and hackers from reading message contents
This security protocol ensures that only the communicating users can read the messages being sent. By encrypting data at the source and only decrypting it at the destination, it prevents intermediaries, including service providers or external attackers, from accessing the content. This level of cryptographic protection is vital for maintaining user privacy and securing sensitive digital conversations.

16. (A) User-generated content and interactivity
The transition to this secondary stage of internet development marked a move away from static, read-only pages toward a more participatory experience. This era introduced technologies that empowered ordinary users to create, share, and modify content themselves. This fundamental shift toward interactivity and user-generated media provided the necessary foundation for the explosion of modern social networking sites.

17. (A) Koo
Launched as a prominent domestic microblogging service, this platform was designed to cater specifically to the Indian audience with a focus on local languages. Its branding features a distinctive yellow bird icon, symbolizing its role as an alternative for real-time public discourse. The service gained significant attention by providing a space for regional expression within the national digital ecosystem.

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86. When signing up for a social media platform, users must agree to a contract outlining the rules of use. What is this legally binding agreement called?
(A) Digital Services Act
(B) Terms of Service (ToS)
(C) Source Code
(D) Memorandum of Understanding

87. During natural disasters, social media platforms are frequently used to map affected areas and gather real-time data from citizens. What is this practice called?
(A) Phishing
(B) Crowdsourcing
(C) Geofencing
(D) Shadowbanning

88. Read the following statements regarding the Cambridge Analytica scandal:
I. It involved the unauthorized harvesting of personal data using a third-party quiz app.
II. The harvested data was used for political micro-targeting during the 2016 US elections.
III. It resulted in massive regulatory fines against Meta (Facebook) by trade commissions.
IV. The incident catalyzed global discussions leading to stricter data privacy regulations.
Which of the above statement(s) is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I and IV only
(D) I, II, III, and IV

89. The Government of India introduced the Grievance Appellate Committee (GAC) mechanism primarily for what purpose?
(A) To approve new social media features before they are launched locally
(B) To hear appeals from users regarding platform grievance decisions
(C) To monitor the private encrypted WhatsApp messages of ordinary citizens
(D) To set the minimum pricing allowed for digital social media advertising

90. According to the IT Rules 2021, if a user complains about content that exposes their private areas or shows them in partial or full nudity, the intermediary must remove or disable access to the content within what time frame?
(A) 24 hours
(B) 12 hours
(C) 48 hours
(D) 72 hours

91. The technological paradigm that enables computers to blend digital interfaces directly into the physical environment, heavily utilized in the development of virtual metaverse spaces, is known as:
(A) Quantum Computing
(B) Spatial Computing
(C) Grid Computing
(D) Cloud Computing

92. The concept of the "Metaverse," which major tech companies are developing as the future of 3D social networking, was first coined in which 1992 science fiction novel?
(A) Neuromancer, the pioneering cyberpunk novel by William Gibson
(B) Ready Player One, the virtual reality adventure by Ernest Cline
(C) Snow Crash, the science fiction novel written by Neal Stephenson
(D) Do Androids Dream of Electric Sheep? by author Philip K. Dick

93. The European Union recently implemented a landmark regulatory framework to force social media platforms to moderate illegal content and provide algorithmic transparency. What is this legislation called?
(A) Communications Decency Act
(B) Online Harms Act
(C) Digital Millennium Copyright Act
(D) Digital Services Act (DSA)

94. Match the Indian alternative digital platforms in List I with their global counterparts or categories in List II:
List I: (Indian Alternative Digital Platform)
P. Koo
Q. ShareChat
R. Chingari
S. Inshorts
List II: (Global Counterpart/Category)
1. News Aggregator
2. Short Video (TikTok equivalent)

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and extensive multimedia content without the same structural limitations on post size.

27. (A) Signal - Microsoft
Among the major messaging applications, most are owned by large technology corporations; however, one prominent privacy-focused service is operated by an independent non-profit foundation. It is not affiliated with the massive software company often associated with personal computing. This independence is a key part of its mission to provide secure, encrypted communication free from corporate data harvesting and commercial interests.

28. (A) P-2, Q-4, R-1, S-3
Different digital platforms are categorized based on their primary functionality and user intent. Professional networking focuses on career growth, while visual sharing emphasizes imagery. Video platforms are designed for hosting and streaming multimedia content, whereas microblogging is defined by short-form text updates. Correctly mapping these platforms to their core types is essential for understanding the modern social media landscape.

29. (C) Signal Protocol
To ensure high-level security for billions of users, this messaging service employs an industry-standard cryptographic system known for its robust end-to-end protection. This specific protocol prevents any third party, including the platform itself, from accessing the plain text of messages. Its implementation across the service has set a significant benchmark for privacy in the instant messaging industry globally.

30. (D) Google
Shortly after its inception, the world's most popular video-sharing site was purchased by a major search engine giant in a landmark deal. This acquisition integrated the platform into a broader ecosystem of digital services, providing the infrastructure and resources needed for global scaling. This move fundamentally changed the landscape of online video and digital advertising, solidifying the parent company's market dominance.

31. (C) Vlogging
The practice of creating and sharing video-based journals or episodic content about personal experiences is a widespread phenomenon on digital platforms. This medium combines storytelling with visual elements, allowing creators to build a personal brand and engage directly with a global audience. It has evolved from a simple hobby into a professional career path for many influential online personalities.

32. (B) Click-Through Rate
In digital advertising and marketing, this metric measures the effectiveness of a link or advertisement by comparing the number of users who clicked it to the total number who viewed it. A higher percentage indicates that the content is relevant and engaging to the target audience. This data is crucial for optimizing campaigns and assessing the return on investment.

33. (B) An online forum and community message board system
This platform operates as a massive network of communities where users can discuss specific topics in dedicated sub-sections. It functions similarly to traditional internet message boards but with modern features like upvoting systems and threaded comments. Its decentralized nature allows for the creation of niche groups covering everything from news and science to hobbies and personal interests.

34. (D) Using fake profiles to repeatedly harass or threaten other individuals
Malicious behavior in the digital realm often involves the persistent use of electronic communication to intimidate or distress an individual. Examples include the creation of deceptive accounts to send threatening messages or spread rumors. Unlike respectful debate or professional criticism, this activity is characterized by a deliberate intent to cause harm and emotional distress through repeated online harassment.

35. (A) A mathematical set of rules determining how content is ranked for users
Social platforms utilize complex sets of automated instructions to determine the order and type of content displayed to individual users. These systems analyze vast amounts of data, including

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are inaccurate in the modern, highly connected information environment.

72. (B) By using data analytics for specific micro-targeting of voter groups
Modern electoral strategies involve the precise use of personal data to deliver tailored messages to specific groups of voters. By analyzing online behavior and demographics, campaigns can identify the most relevant issues for different individuals and influence their opinions more effectively. This data-driven approach has become a central component of political communication and mobilization on social media platforms during elections.

73. (D) I, II, III, IV, and V
To ensure proper governance, large social media entities in India must adhere to several strict organizational requirements. These include appointing specific officials for compliance, law enforcement coordination, and grievance handling. All these personnel must reside within the country and be supported by a physical office address. These measures are designed to make global technology companies more responsive to local laws.

74. (C) Traceability
A highly discussed regulatory requirement in India mandates that certain messaging services must have the technical capability to identify the original sender of a specific piece of information. This rule is intended to help law enforcement track the spread of harmful or illegal content. However, it has raised significant concerns about its potential impact on user privacy and the integrity of encryption.

75. (D) Digital activism and citizen journalism during major political shifts
The series of protests and uprisings that took place in several Middle Eastern and North African countries is often cited as a landmark event where social media played a crucial role. These platforms enabled activists to organize, share real-time updates, and draw international attention to their cause. This demonstrated the power of digital tools in facilitating political change and bypassing state-controlled media.

76. (D) European Union
The most comprehensive and influential data protection law in the world was enacted by a major European political and economic union. It established strict rules for how personal data is collected, processed, and stored, giving individuals greater control over their information. Its impact has been global, forcing technology companies around the world to change their privacy practices to comply with its standards.

77. (D) CERT-In (Computer Emergency Response Team - India)
The primary national agency for managing and responding to cybersecurity incidents works closely with various stakeholders, including social media platforms. Its responsibilities include tracking major threats, issuing alerts, and providing guidance on how to secure digital infrastructure. This organization plays a vital role in protecting the country's information systems and ensuring a resilient digital environment for all users and businesses.

78. (D) Right to be Forgotten
This legal concept allows individuals to request that certain personal information be removed from public search results and social media when it is no longer relevant or accurate. It seeks to balance the public's interest in information with an individual's right to privacy and the ability to move on from their past. This principle has been recognized in several international jurisdictions.

79. (B) User Report → Automated/Human Moderation → Content Action/Warning → User Appeal
The standard procedure for addressing inappropriate content begins when a user flags a post for review. The platform then evaluates the material using either human staff or automated tools to determine if it violates their rules. Following this, the company takes action, such as removal or a warning, and provides a mechanism for the affected user to challenge the decision if they disagree.

80. (B) Monthly
Large social media companies are required by Indian law to provide regular updates on their moderation activities. These reports must include details on the number of complaints received

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diverse perspectives, creating a self-confirming loop of belief. Such spaces can contribute to increased polarization and a lack of critical engagement with opposing ideas online.

45. (C) Alt News
To counter the spread of deceptive information, several independent organizations in India specialize in verifying claims and debunking viral myths. These entities use rigorous methodologies to cross-reference data, analyze images, and provide evidence-based corrections to the public. Their work is crucial for maintaining the integrity of digital discourse and helping citizens distinguish between factual reporting and manufactured fake news.

46. (B) It allows collaborative modification of content and site structure via browsers
The fundamental principle of this type of platform is the ability for multiple people to contribute and refine content directly through their web browsers. This open structure encourages collective intelligence and the rapid accumulation of knowledge. Features such as edit history and discussion pages allow for transparency and the resolution of conflicts, making it a powerful tool for collaborative documentation.

47. (B) Fear Of Missing Out
Psychologists often use a specific term to describe the anxiety people feel when they think others might be having rewarding experiences from which they are absent. This feeling is frequently amplified by social media, where users are constantly exposed to the highlighted lives of others. Such distress can lead to compulsive platform usage and negatively impact overall mental well-being.

48. (B) Podcast
This digital medium consists of original audio recordings that are released in a series and can be downloaded or streamed for listening. It has gained massive popularity due to its convenience and the wide variety of topics available, ranging from news and education to storytelling and comedy. Users typically subscribe to these programs to receive new episodes automatically on their devices.

49. (D) I, II, and III
Modern digital marketing is built on the principle that people follow the actions of others, especially those they trust or admire. Smaller-scale creators often achieve better engagement because they are perceived as more relatable and authentic. Additionally, regulatory bodies have established clear rules requiring that all sponsored or paid content be transparently labeled to protect consumers from deceptive advertising practices.

50. (A) Both A and R are true and R is the correct explanation of A.
Automated systems on social platforms are designed to keep users engaged by showing them content they are likely to enjoy based on their past actions. This personalization often leads to a situation where individuals see only information that confirms their existing beliefs. Consequently, these algorithms play a significant role in creating isolated digital environments that lack diverse viewpoints.

51. (D) Deliberately provoke, upset, or elicit angry responses from others
The primary objective of individuals who engage in disruptive online behavior is to cause agitation or anger in others. This activity is typically characterized by inflammatory, insincere, or off-topic messages intended to derail meaningful conversation. Unlike healthy debate, the goal is not to exchange ideas but to provoke an emotional reaction and gain negative attention within a digital community.

52. (D) Traditional blogs allow long-form content while microblogs enforce brevity
The major distinction between these two forms of digital publishing lies in the length and depth of the content. One allows for comprehensive articles, detailed analysis, and extensive media integration without size constraints. In contrast, the other focuses on short, immediate updates that are restricted to a specific number of characters, favoring quick updates and real-time social interaction.

53. (C) To categorize content and improve discovery across the platform
This metadata tag is used on social platforms to group similar posts together, making it easier for users to find content related to specific topics or

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CHAPTER 19

Artificial Intelligence and Machine Learning

1. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Explainable AI (XAI) is essential for deploying AI systems in critical sectors such as healthcare and the judiciary.
Reason (R): XAI aims to make the decision-making process of complex deep learning models transparent and understandable to human operators.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

2. Which of the following best defines Artificial General Intelligence (AGI)?
(A) AI designed to perform a single specific task efficiently
(B) AI that exceeds human cognitive abilities in all domains
(C) AI that mimics human intelligence across various cognitive tasks
(D) AI that relies exclusively on rule-based programming logic

3. Consider the following statements regarding Machine Learning concepts:
I. Supervised learning requires labeled training data to map inputs to outputs.
II. Unsupervised learning identifies hidden patterns in unlabeled data.
III. Reinforcement learning relies on a system of rewards and punishments.
IV. Clustering is a classic example of supervised learning.
Which of the above statements are correct?
(A) I, II, and IV only
(B) II, III, and IV only
(C) I, II, and III only
(D) I, III, and IV only

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4. Which of the following algorithms is primarily used for classification tasks in supervised learning?
(A) K-Means Clustering
(B) Apriori Algorithm
(C) Support Vector Machines (SVM)
(D) Principal Component Analysis (PCA)

5. Match the initiatives related to India's AI ecosystem in List I with their primary descriptions in List II.
List I: (AI Initiatives)
P. NITI Aayog's strategy theme
Q. INDIAai
R. AIRAWAT
S. RAISE 2020
List II: (Descriptions)
1. Cloud computing infrastructure for AI
2. The National AI Portal of India
3. Global AI Summit hosted by India
4. AI for All
(A) P-2, Q-4, R-3, S-1
(B) P-4, Q-2, R-1, S-3
(C) P-4, Q-1, R-2, S-3
(D) P-1, Q-2, R-4, S-3

6. Which type of machine learning involves an agent interacting with an environment to maximize a reward signal?
(A) Supervised learning
(B) Reinforcement learning
(C) Unsupervised learning
(D) Semi-supervised learning

7. Consider the following statements regarding the history of Artificial Intelligence:
I. The term "Artificial Intelligence" was coined at the Dartmouth Conference in 1956.

to a government-designated committee. The final level of redressal involves the judicial system, which provides a formal legal environment for resolving complex disputes.

63. (A) Net Neutrality
A controversial initiative aimed at providing limited internet access for free was opposed because it favored certain websites over others. This was seen as a violation of the principle that all data on the internet should be treated equally by service providers. Critics argued that such programs would create a tiered internet and stifle competition by giving certain platforms an unfair advantage.

64. (C) P-2, Q-3, R-4, S-1
Regulations require large digital platforms to appoint specific roles for compliance and accountability. This includes an official responsible for overall legal adherence and another for constant coordination with law enforcement. Additionally, a resident officer must handle user complaints directly, while an appellate committee serves as a higher body to hear disputes. This structured approach ensures better governance of social media.

65. (A) 50 lakh users
According to current national regulations, a social media company is subject to stricter compliance requirements if its user base reaches a specific numerical limit. This classification is intended to ensure that platforms with a significant impact on public discourse and social stability are more transparent and responsive to government and user concerns. The current threshold is set at fifty lakh users.

66. (A) OSINT (Open Source Intelligence)
This intelligence discipline involves the collection and analysis of data that is legally available to the public. It includes information from social media posts, news reports, and public records. By synthesizing these diverse sources, analysts can gain valuable insights into events, trends, and the activities of various groups without needing to use classified or intrusive methods of surveillance.

67. (C) Facebook
A major data privacy scandal emerged when it was revealed that a consulting firm had improperly accessed the personal information of millions of individuals through a social media platform. This data was then used to create psychological profiles for targeted political advertising. The event sparked global outrage and led to increased scrutiny of how tech companies protect user data and influence democratic processes.

68. (B) Section 79
A specific provision in national technology law provides a legal shield for online intermediaries, protecting them from being held liable for the content posted by their users. This "safe harbor" is conditional on the platform following certain due diligence requirements and responding to legal requests for content removal. This protection is fundamental to the operation of social media and other user-driven platforms.

69. (A) 24 hours
To ensure that user concerns are addressed promptly, digital regulations specify a strict timeframe for the initial response to a complaint. The designated officer must confirm receipt of the grievance within a single day. This requirement is part of a broader effort to make social media platforms more accountable and responsive to the people who use their services in the country.

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70. (C) Algorithmic bias
When the automated systems that rank and display content produce results that unfairly prejudice certain groups or ideas, it is a sign of underlying flaws in the data or the rules used. This can lead to the marginalization of specific voices and the amplification of others based on non-neutral criteria. Addressing this issue is a major challenge for developers and regulators.

71. (C) I and III only
Digital activism is a potent force that frequently bypasses traditional media to influence real-world policy and highlight important issues. Furthermore, citizen journalism is defined by the contributions of ordinary individuals rather than just professional reporters. Therefore, assertions that this type of activism is powerless or that journalism is restricted to professionals

as an independent authority where individuals can appeal if they are unhappy with how a platform has handled their initial complaint. Its existence ensures that companies are not the final judges in disputes and provides a more transparent redressal process.

90. (A) 24 hours
Due to the sensitive and potentially harmful nature of content that exposes an individual's private parts without their consent, regulations mandate an extremely rapid response. Platforms are required to take down such material within a single day of receiving a report. This swift action is necessary to protect user dignity and minimize the distress and damage caused by such imagery.

91. (B) Spatial Computing
This advanced technological concept involves the use of computers to merge digital information with the physical world in a way that feels natural and immersive. It is a fundamental component of the development of virtual environments where users can interact with 3D objects and each other. This paradigm shift is expected to redefine how people experience social networking in the future.

92. (C) Snow Crash, the science fiction novel written by Neal Stephenson
The term used to describe a collective virtual shared space was first introduced in a popular science fiction novel from the early nineties. The author imagined a future where people use digital avatars to interact in a persistent 3D world. This visionary concept has become the blueprint for modern tech companies as they work to build the next generation of immersive social platforms.

93. (D) Digital Services Act (DSA)
The European Union has recently adopted a major piece of legislation to regulate the digital landscape and ensure a safer online environment. This act sets out new rules for content moderation, algorithmic transparency, and the protection of user rights. It applies to all digital services that connect consumers to content, with particularly strict requirements for the largest and most influential platforms.

94. (C) P-3, Q-4, R-2, S-1
The domestic digital landscape in India has produced several platforms that serve as local versions of global services. These include dedicated tools for regional microblogging and language-specific networking. Additionally, short video apps and news aggregators provide content tailored to the preferences of the local population. These innovations offer diverse options for communication and information consumption within the national social media ecosystem.

95. (B) I, II, and III only
The new digital regulations in Europe apply to all member states and include significant protections for younger users, such as a ban on certain types of targeted advertising. Furthermore, the largest and most influential platforms are required to undergo regular independent audits to assess their impact on society. These rules were formulated by the regional political union to ensure algorithmic transparency and safety.

96. (B) Interoperability
The concept of allowing different digital services to work together seamlessly is a major goal for many regulators. If achieved, it would enable a person on one messaging app to send a message to someone on a completely different platform. This would increase competition and give users more choice by breaking down the "walled gardens" that currently characterize much of the social media landscape.

97. (C) I, II, III, and IV only
The development of immersive virtual spaces relies on several key elements, including digital avatars, 3D environments, and blockchain-based economic systems. These platforms use augmented and virtual reality to create persistent experiences for users. However, the vision for this technology is not based on a single central authority, but rather an interconnected network of various digital worlds that facilitate social interaction.

98. (B) VR immerses the user in a fully enclosed digital environment, while AR overlays digital elements onto the real world
These two technologies offer different ways of experiencing digital content. One creates a

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from users and the specific actions taken in response to those grievances. By mandating these disclosures every month, the government aims to increase transparency and ensure that platforms are actively addressing user concerns.

81. (C) Slacktivism
This term is used to describe forms of digital support for a cause that require very little effort and have no significant real-world impact. Examples include liking a post, sharing a hashtag, or changing a profile picture to show solidarity. Critics argue that while these actions can raise awareness, they often serve as a substitute for more substantive political or social action.

82. (A) Shadowbanning
When a platform reduces the visibility of a user's content without their knowledge, it effectively limits their reach while allowing them to continue posting. This practice is often used to curb the spread of borderline or controversial content that does not quite violate the rules. It remains a contentious issue, as users frequently complain about a lack of transparency and potential bias.

83. (D) The Information Technology (Intermediary Guidelines and Digital Media Ethics Code) Rules, 2021
The comprehensive set of regulations introduced in India to govern digital platforms covers both intermediary guidelines and ethics codes for digital media. It establishes a multi-tiered grievance redressal mechanism and sets out specific due diligence requirements for social media companies. This framework is a significant part of the government's effort to create a more accountable and safe online environment.

84. (C) 15 days
According to national digital regulations, once a standard complaint has been acknowledged by a platform's designated official, it must be fully addressed within a specific two-week period. This timeframe is intended to ensure that user grievances are not ignored and are settled in a reasonable manner. Providing a clear deadline for resolution is a key part of increasing platform accountability.

85. (C) The platform loses its safe harbor immunity for user-generated content
If a social media company fails to follow the mandatory rules set by the government, it can no longer claim legal immunity for the content posted by its users. This means the platform can be held directly responsible in court for any illegal material shared on its service. This significant consequence is intended to encourage strict compliance with national regulations and due diligence.

86. (B) Terms of Service (ToS)
When individuals create an account on a digital platform, they enter into a legally binding contract that defines the rules and responsibilities of both the user and the company. This agreement covers aspects such as content standards, privacy policies, and the platform's right to manage user data. Understanding these conditions is essential for any person who wishes to use these social services.

87. (B) Crowdsourcing
During emergencies, the practice of gathering information and assistance from a large, undefined group of people through digital platforms is extremely valuable. This approach allows authorities and relief organizations to get real-time data on the ground from those directly affected. By leveraging the collective power of the public, responders can better coordinate their efforts and provide more effective assistance to those in need.

88. (D) I, II, III, and IV
The unauthorized use of personal information from millions of users for political purposes highlighted significant flaws in digital data protection. This event triggered massive legal fines and became a catalyst for global discussions on privacy. It demonstrated how social data could be manipulated to influence democratic processes, leading to the implementation of more stringent regulations to safeguard individual information worldwide.

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89. (B) To hear appeals from users regarding platform grievance decisions
The Indian government established a specific committee to provide an additional layer of protection for social media users. This body acts

events. By clicking on the tag, individuals can see a feed of all public messages using that same label. This system is a powerful tool for discovery, organizing information, and tracking trending global conversations.

54. (C) Doxxing
The act of searching for and publishing private or identifying information about a person on the internet without their consent is a serious form of harassment. This information can include home addresses, phone numbers, or workplace details, and is often shared to encourage further abuse. Such practices pose significant safety risks and are prohibited by most platform terms of service.

55. (A) It appears more authentic and builds higher trust among consumers
Content created by ordinary users rather than brands is often perceived as more genuine and relatable by other consumers. This authenticity helps build stronger trust and social proof, as people tend to value the opinions of their peers over traditional corporate advertising. Incorporating these materials into a marketing strategy can enhance community engagement and improve the overall brand image.

56. (A) Reverse chronological order
Traditional weblogs typically display content so that the most recent entries appear at the top of the page. This organization allows regular readers to easily see the latest updates without scrolling through older material. This standard format has been a defining feature of the blogging medium since its inception, emphasizing the timely and current nature of the shared information.

57. (A) Astroturfing
This deceptive marketing technique involves creating the false impression of widespread public support or consensus for a product, policy, or person. By using multiple fake accounts or paid participants to mimic grassroots enthusiasm, organizations aim to influence public opinion dishonestly. This practice undermines the authenticity of online discourse and is often used in political campaigns and corporate public relations.

58. (A) P-2, Q-4, R-3, S-1
Various digital tools serve different functions in the communication landscape. Audio syndication allows for episodic listening, while collaborative platforms enable joint knowledge creation. Short text updates characterize microblogging, and threaded discussions are the hallmark of community forums. Correctly identifying these descriptions is fundamental to understanding how different social technologies facilitate unique types of interaction and content sharing among global users.

59. (C) Deepfake
Advanced artificial intelligence techniques can now be used to create highly realistic but entirely fabricated media. This technology allows for the seamless replacement of a person's face or voice in an existing recording, making them appear to do or say things that never happened. These creations pose significant challenges for truth and security, as they can be used for misinformation or fraud.

60. (B) Eli Pariser
The concept describing the intellectual isolation that results from personalized search results and social media feeds was introduced by an internet activist and author. He argued that as algorithms learn our preferences, they begin to exclude information that challenges our views, effectively trapping us in a personalized information loop. This observation has become central to discussions about digital democracy.

61. (C) Data mining
This process involves the use of sophisticated analytical tools to discover hidden patterns and relationships within extremely large sets of data. In the context of social media, it allows companies to understand user behavior, predict future trends, and deliver highly targeted advertising. While it offers valuable insights for business and research, it also raises significant concerns regarding user privacy.

62. (A) III → I → II
The process for resolving user complaints in India follows a specific hierarchy to ensure accountability. Initially, grievances are addressed by an officer within the social media company. If the outcome is not satisfactory, users can appeal

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completely artificial environment that shuts out the physical world, providing a fully immersive experience. The other overlays digital information onto a user's view of the real world, enhancing their perception without replacing it. Both are expected to play a significant role in the future of social interaction.

99. (D) Decentralization using blockchain technology to give users data ownership
The next phase of the internet's evolution is envisioned as a move toward a more decentralized system where users have greater control over their own data. This would be achieved through the use of blockchain technology and other distributed systems. The goal is to move away from the current model where a small number of large corporations own and control user information.

100. (D) P-4, Q-3, R-2, S-1
Various regions have developed unique legal frameworks to manage social media and protect users. These range from broad digital service acts in Europe to specific intermediary rules in India. Some countries have focused on platform liability for third-party content, while others have established specialized safety commissioners. These diverse regulatory approaches reflect the global effort to balance digital innovation with safety and accountability.

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past interactions, preferences, and connections, to personalize the experience. The primary objective is to maximize user engagement by presenting information that is most likely to be relevant and interesting.

36. (A) Dopamine
Human interaction with digital notifications and social validation triggers the brain's reward system, leading to the release of a specific chemical associated with pleasure and motivation. This neurological response can create a feedback loop that encourages compulsive checking of devices and platforms. Understanding this biological mechanism is essential for addressing the psychological impacts of excessive social media use.

37. (A) RSS (Really Simple Syndication)
The distribution of episodic audio content relies on a specific web feed format that allows users to receive automatic updates from their favorite creators. This technology enables diverse applications and platforms to pull the latest episodes directly into a listener's library. It remains a fundamental, open standard that supports the decentralized nature of the global podcasting ecosystem today.

38. (D) Nano-influencer
Within the hierarchy of digital personalities, individuals with a relatively small but dedicated following are recognized for their high levels of authenticity and audience trust. These creators often focus on very specific interests or local communities, resulting in engagement rates that frequently exceed those of major celebrities. Brands value them for their ability to influence specific, high-intent consumer segments.

39. (D) To help users critically evaluate the credibility of online information
Educational initiatives in the digital age focus on equipping individuals with the skills necessary to analyze and interpret online content effectively. By teaching users how to identify bias, verify sources, and recognize misinformation, these programs foster a more informed and skeptical public. This critical approach is vital for navigating the complex and often misleading information landscape of social media.

40. (D) Moderators
To maintain order and ensure compliance with community standards, digital platforms appoint individuals with the power to manage user-generated content. These officials can remove inappropriate posts, ban disruptive users, and guide discussions within specific groups. Their role is essential for creating safe and productive environments for online interaction, whether they are volunteers or paid professional staff.

41. (C) A is true but R is false.
While it is true that specific encryption methods protect user privacy by making messages unreadable to service providers, the security of this system does not rely on central servers. Instead, the necessary keys for decoding the information are stored only on the participants' devices. Therefore, the claim about the benefits is accurate, but the explanation regarding key storage is incorrect.

42. (C) MediaWiki
The world's most famous collaborative encyclopedia is powered by a specific open-source software package designed to handle massive amounts of user-edited data. This engine facilitates the version control, internal linking, and multi-user editing features that define the platform. Because it is free and highly customizable, it has become the standard tool for creating collaborative knowledge bases and internal wikis.

43. (B) Lookalike Audience
Digital advertising platforms offer sophisticated tools that help businesses expand their reach by identifying potential customers with similar profiles to their current ones. By analyzing demographic data, interests, and online behaviors, the system can find new users who are likely to be interested in a brand's offerings. This targeting strategy significantly improves the efficiency and effectiveness of social media marketing.

44. (B) An echo chamber
An environment where users are predominantly exposed to information that aligns with their existing viewpoints is known for its tendency to reinforce biases. This phenomenon occurs when algorithms or personal choices limit exposure to

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II. ELIZA, developed in the 1960s, was an early natural language processing program.
III. The Turing Test was proposed in the 1980s as a benchmark for AI intelligence.
Which of the above statements are correct?
(A) II and III only
(B) I and II only
(C) I and III only
(D) I, II, and III

8. A standard Natural Language Processing (NLP) text preparation pipeline involves several steps. Consider the following items:
1. Text Classification
2. Tokenization
3. Stop word removal
4. Stemming
What is the correct sequential order of these steps?
(A) 2, 3, 4, 1
(B) 1, 2, 3, 4
(C) 3, 2, 4, 1
(D) 4, 3, 2, 1

9. Which of the following is a classic example of Artificial Narrow Intelligence (ANI)?
(A) A self-aware robotic assistant
(B) A smart speaker like Amazon Alexa
(C) A computer that fully understands human emotions
(D) An AI system capable of independently writing novel scientific theories

10. Match the AI concepts in List I with their corresponding descriptions in List II.
List I: (AI Concepts)
P. Expert System
Q. Genetic Algorithm
R. Fuzzy Logic
S. Natural Language Processing
List II: (Descriptions)
1. Problem-solving utilizing evolutionary concepts like mutation and crossover
2. Architecture comprising a knowledge base and an inference engine
3. Computation based on degrees of truth between 0 and 1
4. Algorithms enabling computers to understand human text and sentiment
(A) P-1, Q-2, R-4, S-3
(B) P-2, Q-3, R-1, S-4
(C) P-2, Q-1, R-3, S-4
(D) P-3, Q-1, R-2, S-4

11. What role do hidden layers play in an Artificial Neural Network?
(A) They serve as the primary output interface for end-user results.
(B) They collect raw input data points from various external sensors.
(C) They encrypt sensitive data to ensure privacy during processing.
(D) They perform non-linear transformations to extract data features.

12. Consider the following statements regarding Generative AI and Large Language Models (LLMs):
I. Generative AI systems can create novel text, images, or audio.
II. Modern Large Language Models are predominantly based on the Transformer architecture.
III. ChatGPT is a prominent example of a generative AI application.
IV. Generative models only analyze existing data and cannot synthesize new patterns.
V. Hallucination in AI refers to the generation of plausible but factually incorrect outputs.
Which of the above statements are correct?
(A) I, III, IV, and V only
(B) II, III, IV, and V only
(C) I, II, III, and V only
(D) I, II, III, IV, and V

13. Who coined the term Artificial Intelligence in 1956?
(A) John McCarthy
(B) Alan Turing
(C) Marvin Minsky
(D) Arthur Samuel

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14. Match the international AI governance frameworks or events in List I with their descriptions in List II.
List I: (Frameworks/Events)
P. GPAI
Q. EU AI Act
R. Bletchley Declaration
S. Asilomar Principles
List II: (Descriptions)
1. Global agreement focused on frontier AI

safety
2. Comprehensive risk-based regulatory legal framework
3. Early set of 23 guidelines for safe AI development
4. International initiative for responsible AI development and use

(A) P-1, Q-3, R-2, S-4
(B) P-2, Q-4, R-3, S-1
(C) P-4, Q-2, R-1, S-3
(D) P-4, Q-1, R-2, S-3

15. K-Means is a popular algorithm used for which of the following processes?
(A) Linear regression
(B) Decision tree generation
(C) Sentiment analysis
(D) Clustering

16. Consider the following statements regarding the types of Artificial Intelligence:
I. Artificial Narrow Intelligence (ANI) is designed to perform specific tasks.
II. Artificial General Intelligence (AGI) possesses human-like cognitive abilities across various domains.
III. Artificial Superintelligence (ASI) refers to AI that matches human intelligence exactly without exceeding it.
Which of the above statements are correct?
(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II, and III

17. In supervised learning, what kind of data is used to train the algorithm?
(A) Labeled data
(B) Unlabeled data
(C) Encrypted data
(D) Synthetic noisy data exclusively

18. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).
Assertion (A): Algorithmic bias in Artificial Intelligence can occur even if the human developers have no intentional prejudice.
Reason (R): Machine learning models learn from historical datasets, which inherently lack any societal biases or historical discrimination.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

19. In the context of AI, what is the Turing Test designed to evaluate?
(A) The computational efficiency of high-performance supercomputers
(B) The mathematical accuracy of complex sorting algorithms
(C) The physical mechanical dexterity of autonomous robotic systems
(D) A machine's ability to demonstrate human-like intelligent behavior

20. Choose the correct chronological sequence indicating the general historical evolution of Artificial Intelligence paradigms.
(A) Large Language Models → Deep Learning → Rule-based Expert Systems → Machine Learning
(B) Rule-based Expert Systems → Machine Learning → Deep Learning → Large Language Models
(C) Machine Learning → Rule-based Expert Systems → Large Language Models → Deep Learning
(D) Deep Learning → Machine Learning → Rule-based Expert Systems → Large Language Models

21. In Deep Learning, what is the basic computational unit inspired by the human brain?
(A) Synapse
(B) Chromosome
(C) Artificial Neuron (Perceptron)
(D) Logic Gate

22. Consider the following statements regarding the features of the National Strategy for Artificial Intelligence in India:
I. The strategy was released by NITI Aayog.
II. The guiding theme of the strategy is "AI for All".
III. Healthcare and Agriculture are identified as key focus areas for AI intervention.
IV. The strategy mandates the immediate

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replacement of human teachers with AI in all public schools.
V. It proposes the establishment of Centers of Research Excellence in AI.

Which of the above statements are correct?
(A) I, II, IV, and V only
(B) I, II, III, and V only
(C) II, III, IV, and V only
(D) I, III, IV, and V only

23. Match the practical applications of AI in List I with their respective sectors in List II.
List I: (AI Applications)
P. Yield prediction and crop monitoring
Q. Real-time transaction fraud detection
R. LiDAR-based navigation
S. Predictive modeling for drug discovery
List II: (Sectors)
1. Transportation
2. Healthcare
3. Agriculture
4. Banking
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-1, R-4, S-2
(C) P-2, Q-4, R-1, S-3
(D) P-3, Q-4, R-1, S-2

24. How does Machine Learning fundamentally differ from traditional programming?
(A) ML uses fixed formulas to generate outputs without using input data.
(B) Traditional coding requires massive datasets to function effectively.
(C) Machine learning systems are incapable of processing numerical data.
(D) ML systems analyze data and outputs to discover the underlying rules.

25. The standard Knowledge Discovery in Databases (KDD) process is used for data preparation in AI. Consider the following items:
1. Data Mining
2. Data Cleaning
3. Pattern Evaluation
4. Data Transformation

What is the correct sequential order of these steps?
(A) 1, 2, 3, 4
(B) 2, 4, 1, 3
(C) 4, 2, 1, 3
(D) 2, 1, 4, 3

26. Consider the following statements regarding Deep Learning and Neural Networks:
I. Artificial Neural Networks are structurally inspired by the biological brain.
II. Convolutional Neural Networks are primarily applied to sequence prediction tasks like text generation.
III. Recurrent Neural Networks possess an internal memory, making them suitable for time-series data.
IV. Deep learning models generally require significantly less data than traditional machine learning models to be effective.

Which of the above statements are incorrect?
(A) I and III only
(B) I, II, and III only
(C) II, III, and IV only
(D) II and IV only

27. What is the main objective of unsupervised learning?
(A) To find hidden patterns or groupings in unlabeled data
(B) To map inputs to known outputs
(C) To maximize numerical rewards through trial and error
(D) To reduce the computational cost of hardware

28. Match the Machine Learning algorithms in List I with their primary learning categories in List II.
List I: (Machine Learning Algorithms)
P. Linear Regression
Q. K-Means
R. Q-Learning
S. Random Forest
List II: (Learning Categories)
1. Supervised Learning
2. Unsupervised Learning
3. Reinforcement Learning
4. Ensemble Learning
(A) P-1, Q-2, R-3, S-4
(B) P-2, Q-1, R-4, S-3
(C) P-4, Q-3, R-2, S-1
(D) P-1, Q-3, R-2, S-4

29. Which logical approach in AI involves deriving a specific conclusion from general premises?
(A) Inductive reasoning
(B) Abductive reasoning

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Systems compared to modern Machine Learning?
(A) They cannot explain their reasoning.
(B) They require humans to manually hardcode every rule and struggle to adapt to new, unseen situations.
(C) They are highly unpredictable and hallucinate frequently.
(D) They require massive amounts of graphical processing power to function.

92. Which statement best encapsulates the concept of a Heuristic in AI problem-solving?
(A) A mathematical proof that identifies the perfect optimal solution every time
(B) A hardware component that prevents computer systems from overheating
(C) A practical shortcut used for finding satisfactory and efficient solutions
(D) A type of malicious computer virus that disrupts AI processing tasks

93. What is the effect of Overfitting in a machine learning model?
(A) The model performs poorly on training data but succeeds on test data.
(B) The model fails to identify the basic underlying patterns in the data.
(C) The model's training time and computational speed increase significantly.
(D) The model captures noise in training data and fails on unseen test data.

94. What is the fundamental mechanism behind Collaborative Filtering in Recommendation Systems?
(A) Recommending items based solely on the keywords in the item's description
(B) Suggesting items in alphabetical order
(C) Predicting user preferences by finding patterns in the behavior of similar users
(D) Randomly selecting items from the database to ensure diversity

95. In Expert Systems, what distinguishes Forward Chaining from Backward Chaining?
(A) Forward uses facts to reach goals; backward uses goals to find facts.
(B) Forward uses goals to find facts; backward uses facts to reach goals.
(C) Forward is for edge hardware; backward is for cloud-based software.
(D) Forward is for numeric data; backward is for alphabetical text strings.

96. What is the most appropriate definition of Data Augmentation in the context of computer vision?
(A) Deleting corrupt or low-quality images to save hardware storage space
(B) Expanding training data by applying various visual transformations
(C) Encrypting visual datasets to prevent unauthorized information access
(D) Translating textual image descriptions into several different languages

97. Which of the following is the most appropriate use case for an Unsupervised Learning algorithm?
(A) Segmenting a company's customer base into distinct purchasing behavior groups without prior labels
(B) Predicting the exact price of a house based on historical sales data
(C) Categorizing incoming emails as Spam or Not Spam based on user flags
(D) Teaching a robotic arm how to pick up a box through trial and error

98. Identify the correct statement regarding Differential Privacy in AI data management.
(A) It is a technique used to publicly publish user passwords securely.
(B) It adds mathematical noise to a dataset so patterns can be learned by AI without revealing individual identities.
(C) It ensures that AI models are fully transparent and open source.
(D) It is a pricing model for accessing premium AI services.

99. Which of the following identifies an incorrect statement about India's AI ecosystem?
(A) The RAISE 2020 summit focused on Responsible AI for Social Empowerment.
(B) NITI Aayog is the nodal agency driving the National Strategy for Artificial Intelligence.
(C) The IndiaAI mission aims to establish a comprehensive AI ecosystem including compute infrastructure and skill development.

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40. Text-to-Speech (TTS) systems often use which technique to sound more natural and human-like?
(A) Rule-based robotic concatenation
(B) Optical Character Recognition
(C) Linear regression modeling
(D) Neural vocoding and prosody modeling

41. Which of the following best describes the ethical concern of Algorithmic Bias in AI?
(A) The tendency of AI systems to consume too much electricity
(B) The risk of AI systems producing unfair outcomes due to prejudiced historical training data
(C) The financial cost of developing AI
(D) The preference of developers to use Python over other languages

42. Which NLP technique is used to determine the emotional tone behind a body of text?
(A) Named Entity Recognition
(B) Part-of-Speech Tagging
(C) Sentiment Analysis
(D) Machine Translation

43. Which AI application is transforming the pharmaceutical industry by significantly reducing the time required to identify promising new medications?
(A) Computer Vision for security
(B) AI-driven drug discovery and molecular modeling
(C) Natural Language Processing for writing emails
(D) Speech recognition for dictating notes

44. An Expert System in AI relies on two primary components. One is the Knowledge Base. What is the other?
(A) The Physical Actuator
(B) The Random Number Generator
(C) The Hardware Compiler
(D) The Inference Engine

45. Which term refers to the phenomenon where Generative AI produces plausible but entirely fabricated or factually incorrect information?
(A) Deep learning
(B) Tokenization
(C) Hallucination
(D) Inference

46. Why are Recurrent Neural Networks (RNNs) particularly suited for Natural Language Processing (NLP)?
(A) They require significantly less processing power than standard algorithms.
(B) They utilize internal memory states to process sequential information.
(C) They analyze high-resolution images by scanning them pixel by pixel.
(D) They operate independently without requiring any labeled training data.

47. Adaptive Learning Systems in education use Artificial Intelligence to achieve which primary goal?
(A) Standardizing curriculum content for all students regardless of ability
(B) Adjusting learning difficulty and pace based on student performance
(C) Automating the physical maintenance of educational campus facilities
(D) Converting traditional paper textbooks into basic digital PDF files

48. In Speech Recognition systems, what is a phoneme?
(A) A graphical representation of a sound wave
(B) The smallest unit of sound in a language that can distinguish words
(C) A hardware microphone component
(D) The algorithm used to filter background noise

49. How does AI assist the banking sector in fraud detection?
(A) By identifying anomalous transaction patterns in real-time
(B) By printing more secure physical currency notes
(C) By locking bank doors automatically after business hours
(D) By replacing all human customer service agents

50. Which of the following real-world applications frequently utilizes Fuzzy Logic?
(A) Generating highly realistic human faces
(B) Text translation from English to Hindi
(C) Temperature control in modern air

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equitably for all demographics.
(C) Unbiased data leads to the generation of random hallucinated facts.
(D) Small data sizes cause models to process human language much faster.

72. Which international regulation, adopted by the European Union, is considered the world's first comprehensive legal framework for AI?
(A) The General Data Protection Regulation for managing user information
(B) The EU AI Act for regulating AI systems based on their risk level
(C) The Asilomar Principles for guiding safe artificial intelligence research
(D) The Bletchley Declaration for international cooperation on AI safety

73. In the context of computer vision, what does Object Detection do that Image Classification does not?
(A) Object detection determines if an image is in color or black and white
(B) Object detection generates a completely new image from text
(C) Object detection compresses the image file size
(D) Object detection identifies the presence of objects and draws bounding boxes around their specific locations

74. The Bletchley Declaration, signed internationally in 2023, primarily focuses on what aspect of AI?
(A) Maximizing corporate profits from AI
(B) Standardizing global pricing for AI software
(C) Addressing the risks and safety concerns of frontier AI models
(D) Mandating open-source code for all government applications

75. Given below are two statements.
Statement I: A high learning rate in a neural network always guarantees a faster and better convergence to the optimal solution.
Statement II: If the learning rate is too high, the model may overshoot the minimum loss and fail to converge.
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true, but Statement II is false.
(D) Statement I is false, but Statement II is true.

76. What does the term Deepfake refer to in the context of Artificial Intelligence?
(A) A deep learning model that has failed to converge during training
(B) A cybersecurity protocol for defending against viruses
(C) An AI model designed specifically to detect fake news articles
(D) Highly realistic, AI-generated synthetic media that replaces a person's likeness or voice with another

77. Identify the correct pair among the following machine learning terms:
(A) Supervised Learning - Reward based training
(B) Unsupervised Learning - Relies on labeled data
(C) Deep Learning - Cannot process unstructured data like images
(D) Reinforcement Learning - Trial and error with delayed rewards

78. Which of the following is NOT one of the five core focus sectors identified in NITI Aayog's National AI Strategy?
(A) Healthcare
(B) Agriculture
(C) Education
(D) Deep-sea Mining

79. In Madhya Pradesh, the application of AI in land record management aims to achieve which outcome?
(A) Increasing manual paperwork
(B) Enhancing transparency, automating mutation processes, and reducing property disputes
(C) Eliminating the need for citizen ownership of land
(D) Generating synthetic satellite imagery of non-existent plots

80. What does the concept of Technological Singularity refer to in the context of the future of AI?
(A) The moment when all computers are connected to a single network
(B) The discovery of a single algorithm that solves all mathematical problems
(C) The event where AI systems lose all their

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61. What is the central guiding theme of NITI Aayog's National Strategy for Artificial Intelligence?
(A) AI for Defense
(B) AI for Economic Dominance
(C) AI for All
(D) AI for Space Exploration

62. Which of the following best describes Transfer Learning in Machine Learning?
(A) Taking a pre-trained model on one task and fine-tuning it for a different, but related task
(B) Transferring data physically via USB drives
(C) Erasing a model's memory to start fresh
(D) Translating code from Python to Java

63. Regarding AI and employment, what is the primary concern associated with automation?
(A) Job displacement for routine and repetitive tasks
(B) That AI will demand higher salaries than human workers
(C) That AI will refuse to work outside of standard office hours
(D) That AI will unionize

64. Which of the following is an exception to the capabilities of current narrow AI systems?
(A) Beating human champions at chess
(B) Diagnosing diseases from medical scans
(C) Demonstrating genuine human empathy and emotional understanding
(D) Transcribing live audio into text

65. India assumed the chairmanship of the Global Partnership on Artificial Intelligence (GPAI) for which term?
(A) 2023-2024
(B) 2015-2016
(C) 2020-2021
(D) 2028-2029

66. Which of the following algorithms is the odd one out in the context of Machine Learning categories?
(A) K-Means Clustering
(B) Linear Regression
(C) Logistic Regression
(D) K-Nearest Neighbors (KNN)

67. Why is Explainable AI (XAI) becoming critically important in high-stakes fields like medicine and criminal justice?
(A) Because XAI models are physically smaller than traditional models
(B) Because XAI completely eliminates the need for computing power
(C) Because users need to understand the reasoning behind an AI's decision to trust and verify it
(D) Because XAI models cannot make any errors

68. Which cognitive capability distinguishes Artificial General Intelligence (AGI) from current Large Language Models?
(A) The ability to generate text quickly
(B) True consciousness, adaptability, and the ability to learn any intellectual task a human can
(C) The ability to pass spelling checks
(D) The ability to translate languages word-for-word

69. In AI ethics, what does the principle of Accountability refer to?
(A) Determining who is responsible when an AI system makes an error or causes harm
(B) Ensuring algorithms are cheap to run
(C) The process of counting the number of lines of code in a program
(D) Maximizing the hardware storage capacity

70. The Government of India approved the comprehensive IndiaAI Mission in 2024. What is one of its primary objectives?
(A) To ban the import of foreign hardware
(B) To replace the Indian Parliament with an AI governance model
(C) To establish a robust AI computing infrastructure and democratize access to GPUs
(D) To restrict AI research to private corporations only

71. What is the most likely cause and effect scenario when training an AI model on a dataset that heavily overrepresents one demographic group?
(A) Biased data results in poor performance for underrepresented groups.
(B) Biased data ensures the model performs

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(C) Deductive reasoning
(D) Analogical reasoning

30. Choose the correct chronological sequence representing the standard Machine Learning development lifecycle.
(A) Model Evaluation → Model Training → Data Collection → Data Preprocessing → Deployment
(B) Data Collection → Model Training → Data Preprocessing → Model Evaluation → Deployment
(C) Data Collection → Data Preprocessing → Model Training → Model Evaluation → Deployment
(D) Data Preprocessing → Data Collection → Model Evaluation → Model Training → Deployment

31. In the context of AI chatbots, what does intent recognition mean?
(A) The chatbot's ability to express its own desires
(B) The ethical guidelines the chatbot follows
(C) The process of identifying the user's goal or purpose from their input text
(D) The programming language used to build the bot

32. In agriculture, AI-powered drones equipped with multi-spectral sensors are primarily used for which of the following?
(A) Automating the driving of transport trucks
(B) Monitoring crop health and predicting yields
(C) Negotiating market prices for crops
(D) Manufacturing synthetic fertilizers

33. What is the primary purpose of the Backpropagation algorithm in neural networks?
(A) To generate new training data
(B) To calculate the gradient of the loss function and update network weights
(C) To format the output text in a readable way
(D) To increase the spatial dimensions of an image

34. In the Indian Judiciary, the SUVAS initiative incorporates AI for what specific purpose?
(A) Predicting the final verdict of criminal cases
(B) Conducting virtual hearings without human judges
(C) Managing the digital parking system of court complexes
(D) Translating judicial documents from English to vernacular languages

35. Which problem is uniquely associated with recommendation systems when a new user joins the platform with no past interaction history?
(A) The Cold Start Problem
(B) The Vanishing Gradient Problem
(C) The Overfitting Problem
(D) The Dimensionality Curse

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36. What is the role of a Prompt in interacting with Large Language Models?
(A) The specific text instruction or query provided by the user to guide the AI's output
(B) The physical hardware button used to turn on the AI
(C) The underlying code that compiles the AI
(D) The legal disclaimer shown before using the AI

37. Convolutional Neural Networks (CNNs) are most commonly used for which application?
(A) Image and video recognition
(B) Speech synthesis
(C) Tabular data regression
(D) Time-series forecasting

38. Genetic algorithms are search heuristics inspired by natural evolution. Which of the following operations is NOT typically a step in a genetic algorithm?
(A) Selection
(B) Crossover
(C) Mutation
(D) Backpropagation

39. Autonomous vehicles rely heavily on LiDAR. What is the primary function of LiDAR?
(A) To generate spoken directions for the passenger
(B) To power the electric battery of the vehicle
(C) To connect the vehicle to satellite radio
(D) To create precise 3D maps of the vehicle's surroundings using laser light

stored data
(D) A hypothetical point in time when artificial intelligence surpasses human intelligence, leading to unforeseeable changes

81. Which of the following algorithms is the odd one out regarding its application?
(A) Convolutional Neural Network (CNN)
(B) Generative Adversarial Network (GAN)
(C) Principal Component Analysis (PCA)
(D) Recurrent Neural Network (RNN)

82. The National Strategy for Artificial Intelligence (NSAI) in India was released by which institution in 2018?
(A) NITI Aayog
(B) Ministry of Home Affairs
(C) Reserve Bank of India
(D) Indian Space Research Organisation

83. In the context of India's AI infrastructure, what does the acronym AIRAWAT stand for?
(A) Advanced Indian Robotics and Web Application Technology
(B) Autonomous Intelligence Resource and Wireless Analysis Tool
(C) Applied Information Research and Wide Area Telecommunications
(D) Artificial Intelligence Research, Analytics and Knowledge Assimilation Platform

84. Which of the following identifies an incorrect statement regarding AI in education?
(A) AI can grade multiple-choice tests efficiently.
(B) Intelligent Tutoring Systems provide personalized feedback to students.
(C) Generative AI ensures absolute factual accuracy without any need for teacher oversight.
(D) AI can help identify students at risk of dropping out based on performance patterns.

85. In Natural Language Processing, what is the purpose of Stop Word Removal?
(A) To delete the most important keywords in a document
(B) To translate the text into a different language
(C) To filter out common words that add little semantic value
(D) To correct grammatical errors automatically

86. To mitigate job displacement caused by AI, policymakers globally emphasize which strategy?
(A) Banning the use of computers in workplaces
(B) Upskilling and reskilling the workforce to handle AI-augmented roles
(C) Limiting AI usage to only the entertainment sector
(D) Reducing the wages of human workers to remain competitive

87. Given below are two statements.
Statement I: Support Vector Machines (SVM) can only be used for linear classification tasks.
Statement II: The Kernel Trick allows SVMs to solve non-linear classification problems.
(A) Both Statement I and Statement II are true.
(B) Both Statement I and Statement II are false.
(C) Statement I is true, but Statement II is false.
(D) Statement I is false, but Statement II is true.

88. INDIAai, the National AI Portal of India, is a joint initiative involving MeitY, NeGD, and which industry association?
(A) FICCI
(B) NASSCOM
(C) CII
(D) ASSOCHAM

89. Which AI technique is used in Predictive Policing to forecast potential criminal activity?
(A) Natural Language Generation
(B) Data mining and spatial analysis of historical crime records
(C) Text-to-speech synthesis
(D) Blockchain cryptography

90. Data privacy is a significant concern in AI. Which technique allows an AI model to be trained across multiple decentralized devices holding local data samples, without exchanging the raw data?
(A) Federated Learning
(B) Centralized Cloud Training
(C) Unsupervised Clustering
(D) Linear Regression

91. Which of the following is considered a major limitation of traditional Rule-Based Expert

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conditioners
(D) High-frequency algorithmic stock trading

51. Generative Adversarial Networks (GANs) consist of two neural networks working in opposition. What are they called?
(A) Encoder and Decoder
(B) Master and Slave
(C) Client and Server
(D) Generator and Discriminator

52. Which underlying mathematical architecture enables Large Language Models like ChatGPT to process context over long text passages effectively?
(A) Markov Chains
(B) Random Forests
(C) K-Nearest Neighbors
(D) The Transformer architecture

53. How does a Collaborative Filtering recommendation system predict user preferences?
(A) By analyzing the features of the items the user previously liked
(B) By randomly suggesting popular items
(C) By analyzing the historical interactions and similarities between multiple users
(D) By using physical sensors to track user movements

54. According to the Society of Automotive Engineers (SAE), what does Level 5 automation in vehicles represent?
(A) Driver assistance features like cruise control
(B) Partial automation where the driver must keep hands on the wheel
(C) Full automation under all conditions with no human intervention required
(D) Vehicles that run on alternative fuels

55. In the context of AI in healthcare, how is predictive analytics primarily utilized?
(A) To forecast disease outbreaks and predict patient deterioration
(B) To perform physical surgeries without human supervision
(C) To automate the billing process for hospital cafeterias
(D) To physically transport patients between wards

56. In Natural Language Processing, the process of breaking text into smaller units like words or subwords is called?
(A) Tokenization
(B) Lemmatization
(C) Stemming
(D) Parsing

57. How can AI enhance governance and policy making in states like Madhya Pradesh?
(A) Analyzing large datasets to optimize the delivery of welfare schemes
(B) Replacing elected human officials with autonomous decision software
(C) Restricting citizen access to digital government information portals
(D) Eliminating the requirement for drafting a traditional state budget

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58. Computer vision involves allowing computers to understand and interpret visual information. Which of the following is an example of image segmentation?
(A) Identifying the boundaries and assigning a class to every pixel in an image
(B) Assigning a single label to a whole image
(C) Converting a color image to grayscale
(D) Generating a text description of an image

59. Credit scoring models enhanced by Machine Learning evaluate a borrower's risk by analyzing which of the following?
(A) The borrower's current account balance and total savings.
(B) The physical characteristics and appearance of the borrower.
(C) Financial history combined with digital payment behavior patterns.
(D) Purely randomized algorithms using basic probability distributions.

60. Unlike classical Boolean logic which relies on strict 0 or 1 values, Fuzzy Logic is based on which concept?
(A) Quantum superposition
(B) Degrees of truth ranging between completely true and completely false
(C) Binary hexadecimal conversions
(D) Cryptographic hash functions

(D) India has completely banned the use of Open Source AI models within its borders.

100. In the context of Global AI Governance frameworks, what is the primary goal of the Asilomar AI Principles established in 2017?

(A) To mandate the use of artificial intelligence in military weaponry

(B) To establish a single global tax rate for technology companies

(C) To ban the creation of open-source artificial intelligence

(D) To outline ethical guidelines and safety standards for the responsible development of AI research

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following patterns, they lack true understanding and the ability to learn any cognitive task across diverse domains. AGI would be able to adapt to new situations and solve problems with the same versatility as humans.

69. (A) Determining who is responsible when an AI system makes an error or causes harm
The principle of accountability in AI ethics addresses the need for clear responsibility when an automated system causes negative consequences or errors. As AI takes on more decision-making roles, it is vital to establish legal and ethical frameworks to hold developers, deployers, or organizations responsible. This ensures that harm can be mitigated and that systems are developed with safety and fairness.

70. (C) To establish a robust AI computing infrastructure and democratize access to GPUs
The IndiaAI Mission, approved in 2024, is a comprehensive government initiative designed to strengthen the nation's technological capabilities. One of its primary objectives is to build a large-scale AI computing infrastructure, including significant GPU capacity. By democratizing access to these resources, the mission aims to support startups, researchers, and public institutions in developing innovative and locally relevant artificial intelligence solutions.

71. (A) Biased data results in poor performance for underrepresented groups.
When an AI model is trained on a dataset that disproportionately represents one demographic, it learns the patterns of that majority group more effectively. Consequently, the model often fails to generalize well to underrepresented groups, leading to lower accuracy and unfair outcomes for them. This phenomenon is a primary cause of algorithmic bias, emphasizing the critical importance of using diverse and inclusive training data.

72. (B) The EU AI Act for regulating AI systems based on their risk level
The EU AI Act is recognized as the world's first major comprehensive legal framework for artificial intelligence. It adopts a risk-based approach, where AI applications are categorized based on the potential harm they could cause. Applications deemed to have "unacceptable risk" are banned, while "high-risk" systems face strict requirements. This landmark regulation aims to ensure that AI used in Europe is safe and trustworthy.

73. (D) Object detection identifies the presence of objects and draws bounding boxes around their specific locations
Image classification assigns a single label to an entire image, identifying what the primary subject is. Object detection goes much further by identifying multiple different objects within a single image and determining their exact spatial location. The system typically indicates these locations by drawing bounding boxes around each detected item, which is essential for tasks like autonomous driving and multi-object tracking.

74. (C) Addressing the risks and safety concerns of frontier AI models
The Bletchley Declaration was signed by multiple countries and international organizations to address the potential risks posed by the most advanced "frontier" AI models. It emphasizes the need for global cooperation to ensure that these powerful systems are developed safely and responsibly. The declaration highlights concerns about catastrophic risks and the importance of establishing shared safety standards and research protocols.

75. (D) Statement I is false, but Statement II is true.
The learning rate is a critical hyperparameter that controls how much to change the model's weights during training. A very high learning rate does not guarantee better convergence; instead, it can cause the optimization process to fluctuate or overshoot the minimum of the loss function. This prevented the model from ever reaching the optimal solution, whereas a properly tuned rate ensures stable learning.

76. (D) Highly realistic, AI-generated synthetic media that replaces a person's likeness or voice with another
Deepfakes are a form of synthetic media created using advanced deep learning techniques, particularly generative adversarial networks. They can convincingly swap faces in videos or mimic a specific person's voice with high accuracy. While this technology has creative

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to categorize the text into specific, pre-defined groups and labels.

9. (B) A smart speaker like Amazon Alexa
Artificial Narrow Intelligence refers to systems specialized in performing a single, well-defined task. Smart speakers function as excellent examples of this technology because they are programmed for specific functions like voice recognition and simple command execution. These systems do not possess general cognitive abilities or self-awareness but excel within their limited, pre-programmed operational domains and their functional boundaries.

10. (C) P-2, Q-1, R-3, S-4
Expert systems utilize a knowledge base and inference engine to mimic human expertise. Genetic algorithms solve problems by simulating evolutionary processes like mutation and crossover. Fuzzy logic handles uncertainty by allowing for degrees of truth between absolute binary values. Natural language processing enables computers to interpret and analyze human text, allowing for a more natural interaction between humans and machines.

11. (D) They perform non-linear transformations to extract data features.
In an artificial neural network, hidden layers are situated between the input and output layers. Their primary role is to process data through non-linear mathematical transformations. This allows the network to capture complex patterns and extract high-level features from raw input. By adjusting weights during training, these layers enable the model to learn sophisticated representations of the underlying data.

12. (C) I, II, III, and V only
Generative AI systems are capable of creating original text, images, or audio based on learned patterns. Modern large language models, like ChatGPT, utilize the Transformer architecture to process contextual information. While these models are highly creative and synthesis-oriented, they can occasionally produce hallucinated or factually incorrect information. They are specifically designed to synthesize new data rather than just analyze it.

13. (A) John McCarthy
John McCarthy is widely recognized as a founding father of artificial intelligence for coining the term at the Dartmouth Conference in 1956. This event marked the formal beginning of the field as a distinct academic discipline. His contributions established the foundational goals and research directions that have guided the development and exploration of intelligent machines for many subsequent decades.

14. (C) P-4, Q-2, R-1, S-3
International AI governance includes diverse frameworks like the Global Partnership on AI for responsible use. The European Union has developed comprehensive, risk-based legal regulations. The Bletchley Declaration focuses on the safety of frontier models through global cooperation. Additionally, early guidelines like the Asilomar Principles provide ethical foundations for developers to ensure that artificial intelligence remains beneficial to humanity.

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15. (D) Clustering
K-Means is a prominent unsupervised machine learning algorithm used for clustering tasks. It partitions a dataset into distinct groups based on the similarity of data points. By calculating the distance between points and centroids, the algorithm identifies natural groupings within unlabeled data, allowing for efficient data organization and the discovery of hidden structural patterns within large and complex datasets.

16. (A) I and II only
Artificial Narrow Intelligence is designed for specific tasks, whereas Artificial General Intelligence aims to match human cognitive abilities across all domains. Artificial Superintelligence, however, refers to a hypothetical future where machine intelligence significantly surpasses human intelligence in every aspect. Therefore, only the definitions relating to narrow and general intelligence levels are currently accepted as technically accurate and valid.

17. (A) Labeled data
Supervised learning requires a training dataset that contains labeled examples. Each input in the dataset is paired with the corresponding correct

output or category. This allows the algorithm to learn the mapping between features and targets. Once the model is trained, it can accurately predict the labels for new, unseen data points by applying the patterns it has learned.

18. (C) A is true but R is false.
Algorithmic bias can occur unintentionally if the training data reflects existing human prejudices. Machine learning models identify and replicate patterns found in historical datasets, which often contain societal biases or historical discrimination. While developers may not have personal prejudices, the reliance on flawed data ensures that the resulting AI systems can perpetuate and even amplify unfair and discriminatory outcomes.

19. (D) A machine's ability to demonstrate human-like intelligent behavior
The Turing Test is a classic benchmark in artificial intelligence proposed by Alan Turing. It assesses whether a machine can exhibit behavior that is indistinguishable from that of a human. During the test, a human evaluator engages in a natural language conversation with both a machine and a human. If the evaluator cannot reliably tell them apart, the machine passes.

20. (B) Rule-based Expert Systems → Machine Learning → Deep Learning → Large Language Models
The historical development of artificial intelligence began with rule-based expert systems that relied on manually coded logic. This evolved into machine learning, where algorithms learned from data. Deep learning further advanced the field by utilizing complex neural network architectures. Finally, large language models emerged as the current state-of-the-art paradigm, enabling sophisticated natural language processing, understanding, and generation capabilities.

21. (C) Artificial Neuron (Perceptron)
The basic computational unit of a neural network is the artificial neuron, also known as a perceptron. It is conceptually inspired by the biological neurons found in the human brain. These units receive multiple inputs, apply weights, and use an activation function to produce an output signal. Layers of these neurons work together to solve complex computational and recognition tasks.

22. (B) I, II, III, and V only
The national AI strategy in India, developed by NITI Aayog, emphasizes social inclusion under the theme "AI for All." It identifies critical sectors like healthcare and agriculture for targeted intervention. Furthermore, it proposes research centers to drive innovation. However, the strategy does not mandate the replacement of teachers, focusing instead on augmenting education through personalized and adaptive digital learning tools.

23. (D) P-3, Q-4, R-1, S-2
Artificial intelligence applications are tailored to specific sector needs. In agriculture, it facilitates yield monitoring, while the banking sector utilizes it for fraud detection. Transportation systems rely on laser-based sensors for autonomous navigation. Meanwhile, the healthcare industry leverages predictive modeling to accelerate drug discovery. These diverse implementations demonstrate how intelligent systems optimize efficiency and accuracy across various professional and industrial domains.

24. (D) ML systems analyze data and outputs to discover the underlying rules.
Traditional programming requires developers to manually write specific rules and logic to process data. In contrast, machine learning uses algorithms that analyze large datasets and their corresponding outputs to discover these rules automatically. This shift allows computers to learn from experience and improve their performance on tasks without being explicitly programmed for every possible scenario or data variation.

25. (B) 2, 4, 1, 3
The Knowledge Discovery in Databases process follows a specific logical sequence to extract meaningful information. It begins with data cleaning to remove noise, followed by data transformation to prepare the format. Data mining algorithms are then applied to identify patterns. Finally, these patterns are evaluated to determine their usefulness and validity, ensuring that the extracted knowledge is accurate and actionable.

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26. (D) II and IV only
Artificial neural networks are inspired by the brain, and recurrent models are ideal for time-series data. However, convolutional networks are primarily designed for image processing rather than text generation. Additionally, deep learning models actually require significantly larger amounts of data than traditional machine learning algorithms to achieve high levels of accuracy and to effectively learn complex representations and features.

27. (A) To find hidden patterns or groupings in unlabeled data
Unsupervised learning is designed to analyze datasets that do not have pre-assigned labels or targets. The primary objective is to discover the underlying structure or natural groupings within the data. By identifying similarities and differences between data points, the algorithm can perform tasks such as clustering or dimensionality reduction, providing valuable insights into complex and unorganized information sources.

28. (A) P-1, Q-2, R-3, S-4
Linear regression is a supervised learning method for predicting continuous values. K-Means is used for unsupervised clustering. Q-Learning represents reinforcement learning where agents learn from rewards. Random Forest is an ensemble method that combines multiple decision trees. These categories reflect the different ways algorithms process data, ranging from mapping inputs to targets to learning through environmental interaction and feedback.

29. (C) Deductive reasoning
Deductive reasoning is a logical process where a specific conclusion is drawn from general premises or established rules. In artificial intelligence, this approach is often used in rule-based systems and formal logic. If the premises are true and the logic is valid, the conclusion must be true. This contrasts with inductive reasoning, which involves making broad generalizations from specific observations.

30. (C) Data Collection → Data Preprocessing → Model Training → Model Evaluation → Deployment
The machine learning development lifecycle begins with the collection of raw data, followed by preprocessing to ensure data quality. Once the data is prepared, the model is trained using specific algorithms. This model is then rigorously evaluated to measure its performance and accuracy. Finally, the finalized system is deployed into a production environment for usage in real-world applications and tasks.

31. (C) The process of identifying the user's goal or purpose from their input text
In the context of AI chatbots and natural language understanding, intent recognition is the ability to determine what a user wants to achieve. By analyzing the input text, the system identifies the underlying purpose, such as booking a flight or asking for help. This process is essential for providing relevant responses and ensuring that the chatbot interacts effectively with humans.

32. (B) Monitoring crop health and predicting yields
AI-powered drones in agriculture use multi-spectral sensors to capture data beyond the visible light spectrum. This information allows farmers to monitor crop health, identify pests, and detect nutrient deficiencies early. By analyzing these data patterns, AI systems can provide accurate yield predictions and help optimize resource usage, such as water and fertilizer, leading to more sustainable and productive farming.

33. (B) To calculate the gradient of the loss function and update network weights
Backpropagation is the fundamental algorithm used for training artificial neural networks. It works by calculating the gradient of the loss function with respect to each weight in the network. By propagating the error backward from the output layer to the input layer, the system can adjust weights to minimize errors. This iterative process allows the model to learn and improve.

34. (D) Translating judicial documents from English to vernacular languages
The SUVAS initiative in the Indian Judiciary leverages artificial intelligence specifically for machine translation. Its primary goal is to translate legal documents, such as orders and judgments, from English into various regional Indian languages. This enhances the accessibility of the legal system for citizens who are more comfortable with their native tongues, thereby

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Through this adversarial process, both networks improve simultaneously, eventually allowing the generator to produce highly realistic synthetic content that is nearly indistinguishable from real data.

52. (D) The Transformer architecture
The Transformer architecture is the underlying mathematical framework that enables modern large language models to process text efficiently. It uses a mechanism called "attention" to weigh the importance of different words in a sentence, regardless of their distance. This allows the model to understand complex contexts and long-range dependencies, making it far superior to older recurrent models for natural language tasks.

53. (C) By analyzing the historical interactions and similarities between multiple users
Collaborative filtering is a recommendation technique that predicts what a user might like based on the preferences of similar users. If User A and User B share similar tastes in movies, the system will recommend films liked by User B to User A. This method relies on collective user behavior data rather than the specific features of the items themselves to generate suggestions.

54. (C) Full automation under all conditions with no human intervention required
Level 5 automation represents the highest stage of vehicle autonomy defined by the Society of Automotive Engineers. At this level, the vehicle is capable of performing all driving functions under all road and environmental conditions that a human driver could manage. No human intervention is required, and the vehicle may not even feature traditional controls like a steering wheel or pedals for occupants.

55. (A) To forecast disease outbreaks and predict patient deterioration
Predictive analytics in healthcare uses historical and real-time patient data to identify future health risks. It can help clinicians forecast the spread of infectious diseases or predict when a hospitalized patient's condition might worsen. By providing early warnings, these AI systems allow medical professionals to intervene sooner, improving patient outcomes and optimizing the allocation of hospital resources and critical care.

56. (A) Tokenization
Tokenization is a fundamental preprocessing step in natural language processing. it involves breaking down a continuous stream of text into smaller, manageable pieces called tokens, such as words, phrases, or characters. This process allows AI models to analyze the structure of the language and perform further tasks like part-of-speech tagging, sentiment analysis, and machine translation with greater accuracy and efficiency.

57. (A) Analyzing large datasets to optimize the delivery of welfare schemes
Artificial intelligence can significantly enhance state governance by improving the efficiency of public service delivery. By analyzing large datasets, governments can identify patterns of need and optimize the distribution of welfare benefits to ensure they reach the intended recipients. This data-driven approach reduces administrative errors, minimizes leakage in the system, and helps policymakers make more informed decisions for citizens.

58. (A) Identifying the boundaries and assigning a class to every pixel in an image
Image segmentation is a computer vision task that goes beyond simple classification or object detection. It involves partitioning an entire image into multiple segments or sets of pixels. By assigning a label to every single pixel, the AI can precisely define the boundaries of objects. This is critical in applications like medical imaging and autonomous driving, where exact spatial understanding is necessary.

59. (C) Financial history combined with digital payment behavior patterns.
Modern credit scoring models use machine learning to provide a more comprehensive view of a borrower's creditworthiness. Instead of relying solely on traditional bank data, these algorithms analyze a wide range of factors, including digital payment histories and spending patterns. This approach allows financial institutions to offer loans to individuals with limited traditional credit history while accurately assessing the risk of default.

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drug discovery process. AI models can analyze vast biological datasets and simulate molecular interactions to identify potential drug candidates much faster than traditional laboratory methods. This significantly reduces the time and cost required to bring new medications to market, ultimately improving patient outcomes and addressing unmet medical needs more efficiently.

44. (D) The Inference Engine
An expert system consists of two main components: the knowledge base and the inference engine. The knowledge base contains specialized facts and rules about a specific domain. The inference engine acts as the reasoning component, applying logical rules to the facts to derive conclusions or solve problems. Together, they allow the system to provide expert-level advice and decision-making in specialized fields.

45. (C) Hallucination
Hallucination describes a phenomenon where generative artificial intelligence models produce outputs that appear confident and plausible but are factually incorrect or nonsensical. This occurs because these models predict the next likely token in a sequence based on statistical patterns rather than a true understanding of facts. Monitoring for such errors is essential for ensuring information reliability and accuracy in AI applications.

46. (B) They utilize internal memory states to process sequential information.
Recurrent Neural Networks are specifically designed to handle sequential data, such as text or speech. Unlike standard feedforward networks, they have internal loops that allow information to persist. This "memory" enables them to understand the context and dependencies between words in a sentence. This characteristic makes them highly effective for natural language processing tasks, including translation, summarization, and sentiment analysis.

47. (B) Adjusting learning difficulty and pace based on student performance
Adaptive learning systems use AI algorithms to personalize the educational experience for each student. By analyzing individual performance and learning patterns in real-time, the system can adjust the difficulty level and delivery of content. This ensures that students are neither bored by simple material nor overwhelmed by difficult tasks, leading to more efficient learning outcomes and better engagement in the classroom.

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48. (B) The smallest unit of sound in a language that can distinguish words
In speech recognition and linguistics, a phoneme is the basic unit of sound that distinguishes one word from another in a particular language. AI systems use phonemes to break down spoken language into its constituent parts for easier processing. By recognizing these individual sounds and their patterns, speech-to-text algorithms can accurately identify words and sentences from varied human voices and accents.

49. (A) By identifying anomalous transaction patterns in real-time
Artificial intelligence enhances bank security by monitoring thousands of transactions every second. Machine learning models are trained on historical data to recognize normal spending behaviors. When a transaction occurs that deviates significantly from these patterns—such as an unusual location or amount—the system flags it as potentially fraudulent in real-time. This proactive approach helps prevent financial loss and protects customers from unauthorized activity.

50. (C) Temperature control in modern air conditioners
Fuzzy logic is frequently used in control systems for household appliances like air conditioners and washing machines. Instead of simple on-off settings, fuzzy logic allows the device to operate on a spectrum of intermediate values. This enables more precise and energy-efficient temperature adjustments by accounting for gradual changes in the environment, resulting in smoother operation and a more comfortable experience.

51. (D) Generator and Discriminator
Generative Adversarial Networks consist of two neural networks, the generator and the discriminator, competing against each other. The generator creates synthetic data, such as images, while the discriminator attempts to distinguish between real and fake samples.

promoting transparency and legal empowerment for all.

35. (A) The Cold Start Problem
The cold start problem occurs in recommendation systems when the algorithm has insufficient data to make accurate predictions. This typically happens with new users who have no history of interactions or with new items that have not yet been rated. Without historical data, the system cannot identify similarities or patterns, making it difficult to provide personalized and relevant suggestions to the user.

36. (A) The specific text instruction or query provided by the user to guide the AI's output
A prompt is the textual input or set of instructions provided by a user to a large language model. It serves as the primary guidance for the AI, determining the context, tone, and content of the generated response. Effective prompt engineering is the practice of refining these instructions to obtain more accurate, relevant, and useful outputs from the generative system.

37. (A) Image and video recognition
Convolutional Neural Networks are a specialized type of deep learning architecture designed for processing structured grid data, such as images. They use convolutional layers to automatically and adaptively learn spatial hierarchies of features. This makes them highly effective for tasks like image classification, object detection, and video analysis, where understanding visual patterns and local dependencies is critical for accurate performance.

38. (D) Backpropagation
Genetic algorithms are optimization techniques inspired by the principles of natural selection and genetics. They involve steps like selection, crossover, and mutation to evolve solutions over generations. Backpropagation, however, is a gradient-based optimization method used specifically for training neural networks. While both are used for learning and optimization, they represent fundamentally different mathematical approaches and biological inspirations within the field.

39. (D) To create precise 3D maps of the vehicle's surroundings using laser light
LiDAR, which stands for Light Detection and Ranging, is a critical sensor technology for autonomous vehicles. It works by emitting rapid laser pulses and measuring the time they take to bounce back from objects. This data allows the vehicle's AI to construct detailed 3D maps of the environment, identifying obstacles, pedestrians, and road boundaries with high precision, even in challenging lighting.

40. (D) Neural vocoding and prosody modeling
Modern text-to-speech systems achieve natural sounding voices by using neural vocoders and advanced prosody modeling. These AI techniques simulate the nuances of human speech, such as rhythm, pitch, and intonation. Unlike older robotic systems that joined recorded clips, neural models generate waveforms directly from text, resulting in much smoother, more expressive, and realistic audio that closely mimics human vocal characteristics.

41. (B) The risk of AI systems producing unfair outcomes due to prejudiced historical training data
Algorithmic bias refers to the systematic and repeatable errors in an AI system that create unfair outcomes, such as privileging one group over another. This typically happens when the data used to train the model contains historical prejudices or lacks diversity. Addressing this concern is essential for ensuring that artificial intelligence is used ethically and equitably across all sectors of society.

42. (C) Sentiment Analysis
Sentiment analysis is a natural language processing technique used to identify and extract subjective information from text. It determines whether the emotional tone of a piece of writing is positive, negative, or neutral. Businesses and researchers use this tool to analyze customer feedback, social media trends, and public opinion, allowing them to understand human emotions and reactions at a large scale.

43. (B) AI-driven drug discovery and molecular modeling
Artificial intelligence is transforming the pharmaceutical industry by accelerating the

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60. (B) Degrees of truth ranging between completely true and completely false
Fuzzy logic is an extension of traditional Boolean logic that allows for degrees of truth rather than simple true or false values. It operates on the principle that many real-world conditions are not absolute but exist on a spectrum. By using membership functions ranging from zero to one, it effectively manages uncertainty and ambiguity in complex decision-making processes and control systems.

61. (C) AI for All
The National Strategy for Artificial Intelligence, published by NITI Aayog, is centered on the theme "AI for All." This guiding principle emphasizes the inclusive and responsible use of AI to drive social empowerment and economic growth. The strategy focuses on applying technology to solve critical challenges in key sectors like healthcare, agriculture, education, smart cities, and sustainable transportation for citizens.

62. (A) Taking a pre-trained model on one task and fine-tuning it for a different, but related task
Transfer learning is a machine learning technique where a model developed for one task is reused as the starting point for a second, related task. This approach is highly efficient because it leverages the features and knowledge already learned from large datasets. It significantly reduces the amount of data and computational time required to train high-performing models for new specialized applications.

63. (A) Job displacement for routine and repetitive tasks
A major concern regarding AI and the workforce is the potential displacement of jobs that involve routine or repetitive manual and cognitive tasks. As automation becomes more capable, these roles may be performed more efficiently by machines. Addressing this challenge requires proactive policies focused on upskilling and reskilling workers to transition into new roles that require human creativity, empathy, and complex problem-solving.

64. (C) Demonstrating genuine human empathy and emotional understanding
Current narrow AI systems excel at specific technical tasks like playing complex games, analyzing medical data, or transcribing speech. However, they lack genuine human consciousness and the ability to feel or express true empathy and emotional understanding. While they can simulate emotional responses using programmed rules, they do not possess the lived experience or social intelligence that characterizes human interpersonal relationships.

65. (A) 2023-2024
India assumed the chairmanship of the Global Partnership on Artificial Intelligence for the 2023-2024 term. This international initiative brings together experts from science, industry, and government to promote the responsible development and use of AI. India's leadership role reflects its growing influence in the global technological landscape and its commitment to shaping ethical and inclusive international standards for emerging technologies.

66. (A) K-Means Clustering
K-Means Clustering is an unsupervised learning algorithm used to find natural groupings in unlabeled data. In contrast, Linear Regression, Logistic Regression, and K-Nearest Neighbors are primarily supervised learning techniques used for predicting specific targets or classifying data based on labeled training sets. The difference in how they handle data and the presence of labels makes K-Means the distinct outlier in this group.

67. (C) Because users need to understand the reasoning behind an AI's decision to trust and verify it
Explainable AI is essential in high-stakes environments because it provides transparency into how a model reaches its conclusions. In medicine or criminal justice, professionals must be able to verify that a decision is based on sound reasoning rather than biased or irrelevant factors. Being able to explain the logic behind an output builds trust and ensures that AI supports responsible decision-making.

68. (B) True consciousness, adaptability, and the ability to learn any intellectual task a human can
Artificial General Intelligence represents a hypothetical level of machine intelligence that possesses human-like flexibility and consciousness. While current large language models are skilled at generating text and

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ANSWERS

1. (A) Both A and R are true and R is the correct explanation of A.
Explainable Artificial Intelligence ensures that complex decision-making processes in deep learning are transparent and interpretable for human users. In sensitive fields like healthcare or the judiciary, transparency is crucial for accountability and trust. By clarifying how a model reaches a conclusion, it provides the necessary justification to support high-stakes professional decisions effectively while maintaining safety and ethical standards.

2. (C) AI that mimics human intelligence across various cognitive tasks
Artificial General Intelligence refers to a hypothetical level of artificial intelligence that can perform any intellectual task that a human being can do. Unlike narrow AI, which is specialized for specific functions, a general intelligence system possesses the versatility to learn and apply knowledge across a wide range of diverse, complex, and previously unseen cognitive domains and environments.

3. (C) I, II, and III only
Supervised learning utilizes labeled datasets to map inputs to outputs, while unsupervised learning focuses on discovering hidden structures in unlabeled data. Reinforcement learning trains agents through feedback from rewards or penalties. Clustering is a primary application of unsupervised learning, as it groups data points based on similarities without using pre-defined labels, distinguishing it from supervised classification tasks.

4. (C) Support Vector Machines (SVM)
Support Vector Machines are supervised learning models used for classification and regression analysis. They work by finding the optimal hyperplane that maximizes the margin between different classes in a multi-dimensional space. While clustering or dimensionality reduction algorithms serve different purposes, this specific method is designed to categorize data points into distinct, pre-defined groups based on trained historical information.

5. (B) P-4, Q-2, R-1, S-3
India's AI ecosystem comprises several strategic pillars. The NITI Aayog strategy focuses on the social theme of inclusivity. The national portal serves as a central knowledge hub for all artificial intelligence developments. Furthermore, dedicated cloud computing infrastructure supports large-scale research, while global summits facilitate international collaboration and dialogue regarding responsible technological empowerment and the deployment of AI-based solutions.

6. (B) Reinforcement learning
Reinforcement learning involves an autonomous agent that interacts with a dynamic environment to achieve a specific goal. The agent learns through a process of trial and error, receiving positive rewards or negative penalties based on its actions. The objective is to determine a policy that maximizes the cumulative reward signal over time through continuous, sequential decision-making and learning.

7. (B) I and II only
The formal field of artificial intelligence began at the Dartmouth Conference in 1956, where the term was officially established. During the 1960s, early natural language processing programs like ELIZA demonstrated basic conversational abilities. However, the Turing Test, used as a benchmark for determining machine intelligence through human conversation, was actually proposed by Alan Turing earlier in 1950.

8. (A) 2, 3, 4, 1
A standard natural language processing pipeline begins with tokenization, which breaks down text into individual units. This is followed by removing common words that lack significant semantic value to simplify the dataset. Stemming then reduces words to their root forms. Finally, the processed data is used for classification tasks

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uses, it also poses significant ethical and security risks, including the potential for spreading misinformation, identity theft, and creating non-consensual manipulated content.

77. (D) Reinforcement Learning - Trial and error with delayed rewards
Reinforcement learning is uniquely characterized by an agent learning through interaction with an environment using a system of trial and error. It receives feedback in the form of rewards or penalties, often with a delay between the action and the result. Supervised learning relies on labels, and unsupervised learning finds patterns in unlabeled data, making the reward-based description specifically accurate for reinforcement learning.

78. (D) Deep-sea Mining
India's National Strategy for Artificial Intelligence identifies five core focus sectors where AI can have the most significant social and economic impact. These include healthcare, agriculture, education, smart cities and infrastructure, and smart mobility and transportation. While deep-sea mining is an important area for resource exploration, it is not listed as one of the primary pillars in the NITI Aayog's strategic document.

79. (B) Enhancing transparency, automating mutation processes, and reducing property disputes
In states like Madhya Pradesh, AI is being integrated into land record management to modernize traditional systems. By automating the mutation process and digitizing records, the technology enhances transparency and accuracy in land ownership data. This reduces the likelihood of manual errors and helps prevent property disputes, leading to more efficient governance and a more secure environment for landowners and buyers.

80. (D) A hypothetical point in time when artificial intelligence surpasses human intelligence, leading to unforeseeable changes
Technological Singularity is a theoretical future point where the growth of artificial intelligence becomes uncontrollable and irreversible. At this stage, AI would surpass human intelligence in every capacity, potentially leading to rapid self-improvement cycles. This event is hypothesized to cause profound and unpredictable changes to human civilization, as the superior intelligence would solve problems and create technologies far beyond current human understanding.

81. (C) Principal Component Analysis (PCA)
Principal Component Analysis is primarily a dimensionality reduction technique used to simplify complex datasets while retaining most of their variance. In contrast, Convolutional Neural Networks, Generative Adversarial Networks, and Recurrent Neural Networks are all types of deep learning architectures designed for tasks like image recognition, data generation, and sequence processing. This functional difference makes PCA the outlier in the group.

82. (A) NITI Aayog
The National Strategy for Artificial Intelligence was released by NITI Aayog, the premier policy think tank of the Government of India, in 2018. The document serves as a comprehensive roadmap for developing and adopting AI in the country. It focuses on using technology for social good and identifies key sectors for implementation, setting the foundation for India's current artificial intelligence policies and initiatives.

83. (D) Artificial Intelligence Research, Analytics and Knowledge Assimilation Platform
AIRAWAT is India's dedicated cloud computing platform for artificial intelligence research and development. It provides the high-performance computing power necessary for training complex machine learning models. By offering scalable infrastructure, it supports researchers, startups, and government agencies in solving large-scale problems. The platform is a key part of India's mission to become a global leader in responsible and inclusive artificial intelligence.

84. (C) Generative AI ensures absolute factual accuracy without any need for teacher oversight.
AI has many beneficial applications in education, such as grading and providing personalized tutoring. However, generative AI models are known to occasionally produce incorrect or biased information, a phenomenon known as hallucination. Therefore, it is incorrect to say they ensure absolute factual accuracy. Human teacher oversight remains essential to verify information,

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(A) 3D CAD Modeling → STL File Generation → Slicing → G-Code → Printing
(B) 3D CAD Modeling → G-Code → STL File Generation → Slicing → Printing
(C) STL File Generation → 3D CAD Modeling → G-Code → Slicing → Printing
(D) Slicing → 3D CAD Modeling → STL File Generation → G-Code → Printing

60. Consider the following statements regarding Industry 4.0:
I. It relies heavily on the Internet of Things (IoT) to connect machines and systems.
II. It aims to create smart factories where machines can predict failures and trigger maintenance autonomously.
III. It completely removes the need for data analytics since machines act on mechanical principles alone.
Which of the above statements is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

61. How do advanced robotic weed control systems reduce the need for chemical herbicides?
(A) Identifying weeds via vision for selective removal or spraying
(B) Genetically modifying crops to resist common garden weeds
(C) Automatically replacing topsoil using heavy crawler machines
(D) Emitting high-frequency sound waves to destroy weed roots

62. What is currently considered the most promising application of nanorobotics in the field of medicine?
(A) Targeted drug delivery to specific cancer cells
(B) Performing large-scale orthopedic surgeries
(C) Replacing human bone structures completely
(D) Physical therapy assistance

63. Consider the following statements regarding robots in agriculture:
I. Harvesting robots often use computer vision to determine the ripeness of fruits.
II. Agricultural drones are used for multispectral imaging to assess crop health.
III. Autonomous tractors rely on GPS and RTK (Real-Time Kinematic) for centimeter-level accuracy.
IV. The use of agricultural robots increases the reliance on manual labor.
Which of the above statements is/are correct?
(A) I, II, and III only
(B) II, III, and IV only
(C) I and IV only
(D) I, II, III, and IV

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64. FutureSkills PRIME is a joint initiative aimed at reskilling and upskilling IT professionals in emerging technologies like Robotics and AI in India. Which entity partnered with the Ministry of Electronics and IT (MeitY) for this?
(A) NITI Aayog
(B) FICCI
(C) NASSCOM
(D) CII

65. The hypothesis that human replicas which appear almost, but not exactly, like real human beings elicit feelings of eeriness and revulsion among observers is known as the:
(A) Uncanny Valley
(B) Turing Test barrier
(C) Frankenstein Complex
(D) Asimov Paradox

66. GreyOrange is a prominent Indian startup that has gained global recognition primarily in the field of:
(A) Warehouse automation and supply chain robotics
(B) Robotic surgery and high-precision medical automation
(C) Autonomous space exploration and rover technology
(D) Deep-sea mining and underwater robotic exploration

67. In defense and military applications, a drone equipped with weapons and intended to engage targets is commonly referred to as a:
(A) UAV (Unmanned Aerial Vehicle)
(B) MAV (Micro Air Vehicle)
(C) UCAV (Unmanned Combat Aerial Vehicle)
(D) HALE (High Altitude Long Endurance)

93. (D) The model captures noise in training data and fails on unseen test data.
Overfitting occurs when a machine learning model becomes too complex and begins to "memorize" the training data, including its random noise and outliers. While the model may show near-perfect accuracy on the training set, it fails to generalize to new, unseen data. This results in poor performance in real-world applications, as the model has failed to learn the true underlying patterns.

94. (C) Predicting user preferences by finding patterns in the behavior of similar users
Collaborative filtering is a core mechanism in modern recommendation systems. It operates on the principle that users who agreed in the past will likely agree in the future. By analyzing the interaction patterns—such as ratings or purchases—of millions of users, the system identifies "neighbors" with similar tastes. It then suggests items that those similar neighbors have liked but the current user hasn't seen yet.

95. (A) Forward uses facts to reach goals; backward uses goals to find facts.
In expert systems, forward chaining is a data-driven approach that starts with available facts and applies inference rules to extract more data until a goal is reached. Backward chaining is a goal-driven approach that starts with a conclusion or goal and works backward to see if there are data and rules that support it. Each method is chosen based on the problem's specific structure.

96. (B) Expanding training data by applying various visual transformations
Data augmentation is a technique used in computer vision to artificially increase the size and diversity of a training dataset. It involves creating modified versions of existing images using transformations like rotation, flipping, zooming, or color adjustment. This helps the AI model become more robust and prevents overfitting, as it learns to recognize objects regardless of their orientation, lighting, or position.

97. (A) Segmenting a company's customer base into distinct purchasing behavior groups without prior labels
Unsupervised learning is best suited for tasks where the goal is to find hidden structures in data without pre-assigned labels. Customer segmentation is a classic example, as the algorithm groups individuals based on shared characteristics like buying habits. Unlike price prediction or spam filtering, which require historical labels to learn from, this process involves discovering natural categories that the developers may not have known beforehand.

98. (B) It adds mathematical noise to a dataset so patterns can be learned by AI without revealing individual identities.
Differential privacy is a rigorous mathematical framework for protecting individual privacy in datasets. It works by adding a calculated amount of "noise" to the data or the query results. This noise is enough to mask the contribution of any single individual, ensuring their identity cannot be determined, while still allowing the AI model to learn accurate overall patterns and statistical trends.

99. (D) India has completely banned the use of Open Source AI models within its borders.
India's AI ecosystem is characterized by proactive government initiatives like the National AI Portal and the RAISE summit. The NITI Aayog leads the national strategy, while the IndiaAI mission builds essential infrastructure and skills. Contrary to any restrictive measures, the country actively encourages innovation and development, including the use of open-source models to foster a collaborative and accessible technological environment for all.

100. (D) To outline ethical guidelines and safety standards for the responsible development of AI research
The Asilomar AI Principles were established by a diverse group of researchers and stakeholders to ensure that artificial intelligence remains beneficial to humanity. These twenty-three principles cover issues like research goals, ethics, and long-term safety. They emphasize the importance of avoiding an AI arms race, ensuring human control, and aligning highly capable systems with human values to prevent future harm and maximize social benefit.

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(C) Laser cutting
(D) 3D printing

39. Wearable robotic suits designed to augment human strength and assist in the physical rehabilitation of patients with mobility impairments are known as:
(A) Humanoid shells
(B) Cybernetic implants
(C) Endoprostheses
(D) Exoskeletons

40. In the banking sector, RPA is heavily utilized for KYC (Know Your Customer) processes. What specific benefit does RPA provide in this context?
(A) It prints physical money faster
(B) It physically transports sensitive documents between branches
(C) It provides manual security surveillance for internal vaults
(D) It automates data extraction and entry into banking systems

41. The following question consists of two statements — Assertion (A) and Reason (R). Select the correct answer using the codes given below.
Assertion (A): The Da Vinci surgical system allows surgeons to operate on a patient from a remote console situated away from the operating table.
Reason (R): The system translates the surgeon's hand movements in real-time into smaller, highly precise movements of tiny instruments inside the patient's body.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

42. Vyommitra, a female-looking half-humanoid robot, has been developed by which Indian organization for its space mission?
(A) DRDO
(B) HAL
(C) ISRO
(D) BARC

43. What is the fundamental difference between CNC machining and 3D printing?
(A) CNC is an additive process while 3D printing is subtractive
(B) Subtractive removal of material versus additive layer building
(C) CNC uses plastics only, while 3D printing uses metals only
(D) CNC requires manual operation, while 3D printing is computer-controlled

44. Computer Integrated Manufacturing (CIM) encompasses the entire production process. Which of the following systems is responsible for the geometric modeling and design phase in CIM?
(A) CAM (Computer-Aided Manufacturing)
(B) ERP (Enterprise Resource Planning)
(C) FMS (Flexible Manufacturing System)
(D) CAD (Computer-Aided Design)

45. The application of robotics and automation in farming to optimize resources, improve crop yields, and reduce environmental impact is termed:
(A) Subtractive agriculture
(B) Conservative agriculture
(C) Precision agriculture
(D) Hydroponic isolation

46. Which robotics company developed the highly expressive humanoid robot named Sophia?
(A) Boston Dynamics
(B) Hanson Robotics
(C) Honda
(D) SoftBank Robotics

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47. What type of radiation do autonomous disinfection robots typically use to destroy the DNA and RNA of viruses and bacteria in hospital rooms?
(A) Gamma rays
(B) Ultraviolet-C (UV-C) light
(C) X-rays
(D) Infrared radiation

48. Which of the following is a widely used software platform specifically designed for Robotic Process Automation (RPA)?
(A) AutoCAD
(B) UiPath

(D) AMRs are used exclusively underwater, whereas AGVs are used on the ground.

10. Which of the following best describes flexible automation in manufacturing?
(A) A system designed to produce a single part at high speed with no variation
(B) A system that requires complete manual reprogramming and hardware changes for every new task
(C) A system capable of producing a variety of parts with virtually no time lost for changeovers
(D) A system where human workers perform all tasks with robotic tools

11. Which of the following accurately describes the difference between an ROV (Remotely Operated Vehicle) and an AUV (Autonomous Underwater Vehicle)?
(A) AUVs are physically tethered to a surface ship, while ROVs operate without tethers.
(B) ROVs are used exclusively for space exploration, while AUVs are used underwater.
(C) AUVs require a human operator to control every movement in real-time.
(D) ROVs are physically tethered to a surface ship, while AUVs operate independently without a tether.

12. Match the following robotic sensors in List I with their primary functions in List II:
List I: (Sensor)
P. Tactile Sensor
Q. Proximity Sensor
R. Vision Sensor
S. Gyroscope
List II: (Function)
1. Measures orientation and angular velocity
2. Detects the presence of nearby objects without physical contact
3. Captures images for object recognition and navigation
4. Detects physical contact, pressure, or touch
(A) P-2, Q-4, R-1, S-3
(B) P-4, Q-3, R-2, S-1
(C) P-4, Q-2, R-3, S-1
(D) P-1, Q-2, R-3, S-4

13. Which principle do vacuum grippers rely on to pick up smooth, flat objects like glass panes or silicon wafers?
(A) Atmospheric pressure difference
(B) Electromagnetism
(C) Mechanical friction
(D) Electrostatic adhesion

14. Which robot programming method involves manually moving the robot arm through the desired path while the controller records the positions?
(A) Offline programming
(B) High-level textual programming
(C) Lead-through programming
(D) Autonomous path planning

15. In drone technology, what does the term BVLOS refer to?
(A) Battery Voltage Low Operation System
(B) Basic Visual Landing and Observation System
(C) Broadband Velocity Local Operating Server
(D) Beyond Visual Line of Sight

16. Who is widely recognized as the Father of Robotics for developing the first industrial robot, Unimate?
(A) Joseph Engelberger
(B) Isaac Asimov
(C) George Devol
(D) Victor Scheinman

17. The following question consists of two statements — Assertion (A) and Reason (R). Select the correct answer using the codes given below.
Assertion (A): Collaborative robots (cobots) can be safely operated without traditional physical safety fences.
Reason (R): Cobots are equipped with advanced force-limiting sensors that detect unusual resistance and immediately stop movement.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

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CHAPTER 20
Robotics and Automation

1. Which type of robot operates on three mutually perpendicular linear axes (X, Y, and Z) and is often used for 3D printing and CNC machines?
(A) Articulated robot
(B) Spherical robot
(C) Cylindrical robot
(D) Cartesian robot

2. Collaborative robots, or cobots, are distinct from traditional industrial robots primarily because:
(A) They operate significantly faster than traditional robots
(B) They can only be programmed using complex coding languages
(C) They work safely alongside humans without safety cages
(D) They possess higher payload capacities than industrial robots

3. Which component of a robotic system is responsible for converting electrical, hydraulic, or pneumatic energy into mechanical motion?
(A) Sensor
(B) Controller
(C) Actuator
(D) End effector

4. Which remote sensing technology uses laser light pulses to measure variable distances to the Earth and is heavily used in mobile robot navigation?
(A) RADAR
(B) SONAR
(C) LiDAR
(D) Infrared

5. Which of the following motions represents the rotational degrees of freedom in a 3D space?
(A) Heave, sway, surge
(B) Roll, pitch, yaw
(C) Up, down, lateral
(D) Forward, backward, sideways

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6. Arrange the following categories of civilian drones in India in increasing order of their maximum all-up weight:
1. Small drone
2. Micro drone
3. Nano drone
4. Large drone
5. Medium drone

(A) 3, 2, 1, 5, 4
(B) 3, 1, 2, 4, 5
(C) 2, 3, 1, 5, 4
(D) 1, 2, 3, 5, 4

7. The word robot was first introduced by the Czech writer Karel Capek in his 1920 play R.U.R. What does the acronym R.U.R. stand for?
(A) Real Universal Robotics
(B) Rossum's Universal Robots
(C) Rossum's United Robots
(D) Robotic Utility Resources

8. What is the specific term for the device attached to the wrist of a robot arm that interacts with the environment, such as a gripper or a welding torch?
(A) Actuator interface
(B) End effector
(C) Base controller
(D) Proximal link

9. What is the key difference between an Automated Guided Vehicle (AGV) and an Autonomous Mobile Robot (AMR)?
(A) AGVs navigate freely without physical guides, while AMRs require tracks.
(B) AGVs rely on pre-defined paths like magnetic strips or wires, while AMRs navigate dynamically using sensors and maps.
(C) AMRs rely on pre-defined paths like magnetic strips or wires, while AGVs navigate dynamically using sensors and maps.

30. Arrange the following levels of autonomy for mobile robots and autonomous vehicles in their correct developmental sequence from lowest to highest autonomy:
1. Conditional Automation
2. No Automation
3. High Automation
4. Partial Automation
5. Full Automation

(A) 2, 4, 1, 3, 5
(B) 2, 1, 4, 3, 5
(C) 2, 4, 3, 1, 5
(D) 4, 2, 1, 3, 5

31. Which of the following tasks is most suitable for Unattended RPA rather than Attended RPA?
(A) A customer service agent retrieving a client's profile during a live call
(B) A bank teller verifying a signature at the counter
(C) Batch processing of thousands of end-of-day payroll transactions overnight
(D) An HR executive manually approving discretionary bonuses

32. In CNC programming, what is the primary purpose of G-codes?
(A) Controlling auxiliary functions like turning coolant on or off
(B) Preparing toolpaths to control machine motion and positioning
(C) Generating digital logs of specific machine hardware errors
(D) Designing the geometric 3D model on the computer interface

33. Match the following unmanned systems in List I with their operating domain in List II:
List I: (Unmanned System)
P. UCAV
Q. ROV
R. UGV
S. ASV
List II: (Operating Domain)
1. Surface of the water
2. Land/Ground
3. Aerial/Sky
4. Underwater

(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-4, R-2, S-1
(C) P-3, Q-1, R-2, S-4
(D) P-2, Q-4, R-3, S-1

34. The Da Vinci Surgical System is a pioneer in robotic surgery. What is its primary clinical advantage?
(A) It performs complex surgeries completely autonomously without a surgeon.
(B) It replaces the need for anesthesia during operations.
(C) It is specifically designed to conduct brain surgeries only.
(D) It enables minimally invasive surgeries with enhanced precision, flexibility, and control.

35. What does the term Digital Twin represent in the context of smart manufacturing and automation?
(A) A virtual representation of a physical system for monitoring
(B) Two identical robots working on the same production line
(C) A backup power generator for manufacturing plants
(D) A dual-core processor used in robotic controllers

36. How do advanced robotic weed control systems reduce the need for chemical herbicides?
(A) Identifying weeds via vision for selective removal or spraying
(B) Genetically modifying crops to resist common garden weeds
(C) Automatically replacing topsoil using heavy crawler machines
(D) Emitting high-frequency sound waves to destroy weed roots

37. Unmanned Ground Vehicles (UGVs) are extensively used in hazardous environments. Which of the following is a classic example of a UGV application?
(A) Explosive ordnance disposal (bomb disposal)
(B) Aerial crop spraying
(C) Deep-sea cable inspection
(D) High-altitude weather tracking

38. Additive manufacturing is the formal industrial term for which popular technology?
(A) Injection molding
(B) CNC milling

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provide emotional support, and guide the ethical use of these digital tools.

85. (C) To filter out common words that add little semantic value
Stop word removal is a common preprocessing step in natural language processing. It involves deleting frequently occurring words like "the," "is," and "at" from a dataset. Since these words appear in almost every sentence but do not carry much specific meaning for tasks like sentiment analysis or topic modeling, removing them helps reduce noise and improves the computational efficiency of models.

86. (B) Upskilling and reskilling the workforce to handle AI-augmented roles
To address the potential for job displacement caused by automation, global experts emphasize the importance of upskilling and reskilling. This strategy involves training workers to use AI tools and transition into new roles that complement automated systems. By focusing on lifelong learning and developing skills that machines cannot easily replicate, such as complex reasoning and empathy, the workforce can remain competitive and productive.

87. (D) Statement I is false, but Statement II is true.
Support Vector Machines are versatile algorithms capable of both linear and non-linear classification. While they find linear boundaries in a given space, the use of the "kernel trick" allows them to operate in much higher-dimensional spaces. This enables the model to effectively separate data that is not linearly separable in its original form, making it a powerful tool for complex classification tasks.

88. (B) NASSCOM
INDIAai is the official National AI Portal of the Government of India. It is a collaborative initiative between the Ministry of Electronics and Information Technology, the National e-Governance Division, and NASSCOM, the premier trade association for the Indian IT-BPM industry. The portal acts as a central repository for AI-related news, resources, and ecosystem updates, fostering a vibrant artificial intelligence community in India.

89. (B) Data mining and spatial analysis of historical crime records
Predictive policing uses artificial intelligence to identify potential crime hotspots and forecast future criminal activity. This is achieved by applying data mining techniques and spatial analysis to historical crime records, such as the time, location, and nature of past incidents. By recognizing patterns in this data, law enforcement agencies can allocate resources more effectively to prevent crimes before they occur.

90. (A) Federated Learning
Federated learning is a decentralized machine learning technique that allows an AI model to be trained across multiple devices without sharing their raw data. Instead of sending data to a central server, the devices train the model locally and only share the updated model weights. This approach significantly enhances data privacy and security, making it ideal for sensitive applications like healthcare or finance.

91. (B) They require humans to manually hardcode every rule and struggle to adapt to new, unseen situations.
Traditional rule-based expert systems depend on manually programmed "if-then" logic provided by human experts. Because they cannot learn from new data, they are rigid and often fail when encountering scenarios not covered by their pre-defined rules. Modern machine learning overcomes this limitation by automatically discovering patterns in data, allowing systems to be much more flexible, scalable, and adaptive to change.

92. (C) A practical shortcut used for finding satisfactory and efficient solutions
In artificial intelligence and problem-solving, a heuristic is a practical method or "rule of thumb" that is not guaranteed to be perfect but is sufficient for the immediate goal. Heuristics are used to speed up the process of finding a satisfactory solution when an exhaustive search is computationally impossible. They trade off some accuracy or optimality for significant gains in speed and efficiency.

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(C) MATLAB
(D) SolidWorks

49. A CNC machine system that incorporates sensors to monitor the actual position of the cutting tool and correct any deviations from the programmed path is called a:
(A) Closed-loop control system
(B) Open-loop control system
(C) Feed-forward control system
(D) Manual override system

50. In a fully automated business, what is the primary role of an ERP (Enterprise Resource Planning) system?
(A) Hardware that physically cuts and shapes raw materials
(B) Specialized motor driver software for large CNC machines
(C) A central database that integrates all business processes
(D) Systems used to test the chemical properties of products

51. What is the name of the remotely operated vehicle developed by India's DRDO primarily for handling, inspecting, and disposing of unexploded ordnance and improvised explosive devices (IEDs)?
(A) Rustom
(B) Netra
(C) Nishant
(D) Daksh

52. Robotic Process Automation (RPA) is best defined as:
(A) Physical robots that assemble mechanical parts in a factory
(B) The implementation of robotic arms in agricultural harvesting
(C) Hardware devices used to automate network routing protocols
(D) Software that mimics human actions within digital systems

53. Industry 4.0 refers to the Fourth Industrial Revolution. Which of the following is the core characteristic of Industry 4.0?
(A) Introduction of mechanical production powered by water and steam
(B) Division of labor and mass production using electrical energy
(C) Integration of Cyber-Physical Systems, IoT, and cloud computing
(D) The replacement of all electronic circuits with vacuum tubes

54. Which technology involves a pill-sized device containing a tiny camera that a patient swallows to take pictures of the digestive tract?
(A) Robotic laparoscopy
(B) CyberKnife surgery
(C) Capsule endoscopy
(D) Nanobots delivery

55. Which of the following 3D printing technologies works by melting and extruding a thermoplastic filament layer by layer?
(A) Fused Deposition Modeling (FDM)
(B) Stereolithography (SLA)
(C) Selective Laser Sintering (SLS)
(D) Digital Light Processing (DLP)

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56. What was the name of the advanced bipedal humanoid robot developed by Honda, designed to interact with humans and capable of running and climbing stairs?
(A) ASIMO
(B) Atlas
(C) Pepper
(D) Valkyrie

57. Which of the following is NOT a standard component of the Da Vinci Surgical System?
(A) Fully autonomous AI decision engine
(B) Surgeon console
(C) Patient cart with robotic arms
(D) Vision cart

58. High transaction volumes and strict regulatory compliance requirements in banking lead to the adoption of automated reconciliation. This is an example of a:
(A) Cause and Effect relationship driving digital automation
(B) Hardware limitation
(C) Decrease in digital security
(D) Failure of core banking software

59. Which of the following represents the correct sequence of steps in the 3D printing (additive manufacturing) process?

18. In industrial robotics, what term is used to describe the maximum weight a robot can manipulate at its end effector while maintaining its rated precision?
(A) Payload capacity
(B) Maximum reach
(C) Manipulator strength
(D) Kinetic load

19. Which ISO technical specification specifically addresses the safety requirements for collaborative robots and their work environment?
(A) ISO 9001
(B) ISO 14001
(C) ISO 27001
(D) ISO/TS 15066

20. In control systems for robotics, what does the acronym PID stand for?
(A) Proportional Integral Derivative
(B) Programmable Intelligent Device
(C) Position Internal Dynamics
(D) Pulse Integration Data

21. What is the primary function of an Electronic Speed Controller (ESC) in a rotary-wing drone?
(A) To control the camera gimbal
(B) To transmit live video feed to the operator
(C) To regulate the speed and direction of the electric motors
(D) To track the drone's GPS location

22. A SCARA robot is widely used in industrial assembly lines. What does SCARA stand for?
(A) Standard Control And Robotic Automation
(B) Selective Compliance Assembly Robot Arm
(C) Systematic Computerized Articulated Robot Arm
(D) Synchronous Compliance And Rotary Actuator

23. An object in free space has a maximum of how many degrees of freedom?
(A) 3
(B) 4
(C) 6
(D) 8

24. In the context of autonomous navigation, what does SLAM stand for?
(A) Synchronized Location and Mapping
(B) System Logistics and Automated Movement
(C) Spatial Layout and Measurement
(D) Simultaneous Localization and Mapping

25. Find the odd one out among the following types of robotic end effectors.
(A) Vacuum gripper
(B) Stepper motor
(C) Magnetic gripper
(D) Mechanical finger gripper

26. What is the primary function of a controller in a robotic system?
(A) To use end effectors for physically gripping and manipulating objects
(B) To capture and transmit environmental data using various sensors
(C) To provide stable physical structural support to the robot arm
(D) To process environmental data and direct the system's actuators

27. Which of the following is an example of an Unmanned Aerial Vehicle (UAV)?
(A) A quadcopter drone surveying agricultural land
(B) An underwater ROV surveying a pipeline
(C) A robotic arm welding a car chassis
(D) An automated forklift in a warehouse

28. The number of independent parameters that define the configuration or state of a robotic system is known as its:
(A) Degrees of freedom
(B) Total work envelope
(C) Rated payload limit
(D) Maximum axis capacity

29. Which statement accurately highlights a disadvantage of using collaborative robots compared to standard traditional industrial robots?
(A) They are generally much heavier and larger in construction
(B) They consume exponentially more electricity during operation
(C) They often have slower speeds to maintain human safety
(D) They cannot perform highly repetitive tasks in a cell

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68. A defining characteristic of a swarm robotic system is that:
(A) There is one central supercomputer controlling all robots simultaneously.
(B) The robots rely on decentralized control and local communication to accomplish tasks.
(C) The swarm consists of multiple highly complex humanoid robots.
(D) The robots cannot function unless continuously monitored by a human operator.

69. In the ethics of automation and autonomous vehicles, a famous thought experiment highlighting the moral dilemma of choosing between two harmful outcomes is called the:
(A) Trolley Problem
(B) Prisoner's Dilemma
(C) Turing Paradox
(D) Chinese Room Argument

70. In robotics research and education, what does ROS stand for?
(A) Robotic Operations Simulator
(B) Robot Operating System
(C) Real-time Object Sensor
(D) Remote Operation Server

71. Match the following ethical and robotics concepts in List I with their descriptions in List II:
List I: (Concept)
P. Robot Rights
Q. Algorithmic Bias
R. Singularity
S. Machine Ethics
List II: (Description)
1. Systematic and repeatable errors in a computer system that create unfair outcomes
2. The debate over whether advanced AI deserves moral standing or legal protections
3. The design of artificial agents capable of moral reasoning
4. A hypothetical future point where technological growth becomes uncontrollable and irreversible
(A) P-2, Q-1, R-4, S-3
(B) P-1, Q-2, R-3, S-4
(C) P-3, Q-4, R-1, S-2
(D) P-2, Q-4, R-1, S-3

72. What was the name of the robotic rover that successfully rolled out onto the lunar surface from the Vikram lander during ISRO's Chandrayaan-3 mission?
(A) Bhaskara
(B) Pragyan
(C) Vayu
(D) Aditya

73. Nanorobotics involves creating machines or robots at or close to the scale of a nanometer. One nanometer is equal to:
(A) 10^{-6} meters
(B) 10^{-9} meters
(C) 10^{-12} meters
(D) 10^{-3} meters

74. The field of study dedicated to developing artificial intelligence and social robots that can detect, interpret, and respond to human emotions is called:
(A) Cognitive behavioral computing
(B) Quantum computing
(C) Affective computing
(D) Heuristic programming

75. ABU Robocon is a widely recognized college-level robotics competition in the Asia-Pacific region. What does ABU stand for?
(A) Advanced Biorobotics Union
(B) Asian Board of Unmanned-systems
(C) Artificial Brains United
(D) Asia-Pacific Broadcasting Union

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76. Which robot successfully deployed the Ingenuity helicopter on the surface of Mars?
(A) Curiosity Rover
(B) Opportunity Rover
(C) Sojourner Rover
(D) Perseverance Rover

77. Consider the following statements regarding swarm robotics:
I. It relies heavily on decentralized decision-making processes.
II. A failure of a single robot critically halts the entire swarm's operation.
III. It is highly scalable, meaning adding more robots generally does not require redesigning the control architecture.
Which of the above statements is/are

appropriately to changes in its external environment.

27. (A) A quadcopter drone surveying agricultural land
Unmanned aerial technology encompasses a wide range of platforms designed to fly without a human pilot onboard. These vehicles are used for diverse applications such as remote sensing, package delivery, and infrastructure inspection. A common example involves multi-rotor aircraft used in farming to capture high-resolution imagery, helping growers monitor crop health and manage resources more effectively from the sky.

28. (A) Degrees of freedom
The complexity of a robot's movement is determined by the number of independent variables required to specify its location and orientation. Each joint or axis of motion adds to the total flexibility of the system, allowing it to reach different points in space. Measuring these parameters helps engineers determine if a robot is capable of performing specific intricate tasks in manufacturing.

29. (C) They often have slower speeds to maintain human safety
While robots designed for human interaction offer significant advantages in flexibility, they operate under strict speed constraints to ensure the safety of nearby workers. High-speed industrial robots usually require barriers because their momentum could cause injury. To function without these cages, collaborative models must limit their kinetic energy, which can result in lower overall throughput compared to traditional high-speed units.

30. (A) 2, 4, 1, 3, 5
The progression of autonomous technology is defined by the level of human intervention required during operation. Systems range from those entirely controlled by humans to those requiring minor assistance, followed by conditional and high levels of automation. The ultimate goal is a system that can handle all driving or operational tasks independently in any environment without any human monitoring.

31. (C) Batch processing of thousands of end-of-day payroll transactions overnight
Software automation can be classified by whether it requires human triggers or runs independently on a server. High-volume tasks that occur on a schedule and involve predictable data processing are best suited for independent execution. This allows large organizations to handle repetitive administrative duties, such as financial reconciliations or data migrations, during off-hours without needing any manual oversight or intervention.

32. (B) Preparing toolpaths to control machine motion and positioning
Computerized machining relies on a standardized language to tell the hardware exactly how to move. These instructions define coordinates for the cutting tool, specify movement speeds, and determine the paths required to shape a workpiece. By translating digital designs into these specific codes, manufacturing equipment can produce complex parts with high precision and repeatability according to a programmed sequence.

33. (B) P-3, Q-4, R-2, S-1
Unmanned systems are categorized by the environment in which they operate. Combat aerial vehicles maneuver through the sky, while remotely operated tools explore the depths of the ocean. Ground-based units travel across land for surveillance or logistics, and surface vessels move across the top of water bodies. Each type is engineered with specialized propulsion and communication systems for its specific domain.

34. (D) It enables minimally invasive surgeries with enhanced precision, flexibility, and control.
Advanced surgical technology allows doctors to perform complex procedures through very small incisions. By using robotic arms that translate a surgeon's hand movements into micro-movements, the system provides greater precision than the human hand alone. This results in less trauma for the patient, reduced blood loss, and faster recovery times, revolutionizing the field of modern medical operations and patient care.

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(A) Direct verbal communication between robots
(B) The physical docking of two robots to transfer power
(C) Indirect coordination through modification of the environment
(D) Centralized mission planning by an external server

86. Many deep-space robotic missions, like the Mars rovers, cannot rely on solar panels due to distance from the sun or dust storms. What is their primary power source?
(A) Lithium-ion battery packs only
(B) Radioisotope Thermoelectric Generators (RTG)
(C) Hydrogen fuel cells
(D) Internal combustion engines

87. Which prominent international robotics competition for students is organized annually where teams build robots to perform specific tasks?
(A) Robocon
(B) FIRST Robotics Competition
(C) World Robot Olympiad
(D) RoboCup

88. Which robotics platform uses block-based programming interfaces like Scratch and was developed for education and maker communities?
(A) Industrial SCARA
(B) Da Vinci System
(C) LEGO Mindstorms
(D) Fanuc R-2000iB

89. Isaac Asimov introduced the "Three Laws of Robotics" in his science fiction stories. Which of the following correctly states the First Law?
(A) Always obeying orders given to the robot by human beings
(B) Preventing injury to humans or allowing harm through inaction
(C) Protecting its own existence without violating higher laws
(D) Avoiding deception of humans through any action or word

90. Swarm robotics is fundamentally inspired by the collective behavior of which of the following natural systems?
(A) Social insects like ants and bees
(B) Solitary predators like tigers
(C) Migratory patterns of whales
(D) The growth patterns of trees

91. Match the following major global robotics companies in List I with their country of origin in List II:
List I: (Company)
P. FANUC
Q. KUKA
R. Boston Dynamics
S. ABB
List II: (Country)
1. Switzerland
2. United States
3. Japan
4. Germany
(A) P-1, Q-2, R-3, S-4
(B) P-3, Q-4, R-2, S-1
(C) P-4, Q-3, R-1, S-2
(D) P-2, Q-1, R-4, S-3

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92. What does CNC stand for in the context of automated machine tools?
(A) Computer Network Control
(B) Centralized Node Control
(C) Computer Numerical Control
(D) Cybernetic Navigational Controller

93. The term 'cobot' was co-invented by researchers at which institution?
(A) Massachusetts Institute of Technology (MIT)
(B) Stanford University
(C) Oxford University
(D) Northwestern University

94. In the field of robotic autonomy, the concept of a machine generating its own code or fixing its own physical hardware dynamically is an example of:
(A) Reactive automation
(B) Hard automation
(C) Evolutionary robotics and self-healing systems
(D) Lead-through programming

INCORRECT?
(A) I only
(B) II only
(C) I and III only
(D) III only

78. In disaster management, highly flexible, multi-jointed robots designed to navigate through the narrow rubble of collapsed buildings are known as:
(A) Quadruped robots
(B) Humanoid robots
(C) Hexapod robots
(D) Snake robots

79. A structural technique frequently proposed for building nanorobots, which involves folding DNA molecules into complex 2D and 3D shapes, is called:
(A) DNA sequencing
(B) DNA origami
(C) Polymerase Chain Reaction (PCR)
(D) CRISPR-Cas9

80. Consider the following statements regarding robots in disaster management:
I. They can be safely deployed in high-radiation zones, such as nuclear meltdowns.
II. Unmanned Aerial Vehicles (UAVs) provide rapid aerial mapping of disaster-struck areas.
III. Snake robots are specifically used to navigate through tightly packed rubble to locate survivors.
IV. Disaster robots currently operate entirely without any human monitoring or intervention.
V. Thermal imaging cameras mounted on robots assist in finding trapped humans in low-visibility conditions.
Which of the above statements is/are INCORRECT?
(A) I and II only
(B) IV only
(C) III and V only
(D) I, IV, and V only

81. Which of the following is an example of Robotic Process Automation (RPA) rather than physical robotics?
(A) Deploying an unmanned drone to deliver a medical package
(B) Programming an automated arm to paint a car body frame
(C) Migrating data from a legacy spreadsheet to a cloud database
(D) Utilizing an autonomous forklift to transport warehouse pallets

82. Match the following Indian defense and space robotic systems in List I with their primary descriptions in List II:
List I: (System)
P. Rustom
Q. Daksh
R. Vyommitra
S. Netra
List II: (Description)
1. Lightweight, autonomous UAV for surveillance
2. Medium Altitude Long Endurance (MALE) UAV
3. Spacefaring half-humanoid robot
4. Remotely operated vehicle for bomb disposal
(A) P-2, Q-4, R-3, S-1
(B) P-4, Q-2, R-1, S-3
(C) P-1, Q-3, R-4, S-2
(D) P-2, Q-1, R-3, S-4

83. PARO is a therapeutic robot used in hospitals and nursing homes to elicit emotional responses from patients. What animal is PARO modeled after?
(A) Dog
(B) Cat
(C) Dolphin
(D) Baby harp seal

84. The impact of industrial automation in India has led to the loss of routine manual jobs while simultaneously increasing the demand for skilled technicians and data analysts. This phenomenon in the labor market is known as:
(A) Job standardization
(B) Structural homogenization
(C) Job polarization
(D) Labor stagnation

85. In the context of swarm robotics and biological inspiration, what does the term 'stigmergy' mean?

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ANSWERS

1. (D) Cartesian robot
   Linear robotic systems operate through a series of sliding joints that allow movement along three perpendicular axes. This configuration creates a rectangular workspace, making it ideal for precision tasks such as additive manufacturing and automated milling. These systems provide high structural rigidity and simplify the mathematical calculations required for movement, which is why they are common in industrial machinery.

2. (C) They work safely alongside humans without safety cages
   Modern industrial environments have evolved to allow closer interaction between machines and personnel. Specialized robotic units are designed with advanced force-sensing technologies and rounded edges to prevent accidents. Unlike traditional systems that require heavy physical barriers for protection, these machines can detect physical contact and stop instantly, fostering a shared workspace that improves overall operational efficiency and flexibility.

3. (C) Actuator
   Every robotic system requires a specialized component to bridge the gap between digital commands and physical movement. These devices receive signals from the controller and utilize energy sources like electricity or compressed air to move joints or limbs. Without these power-converting units, a robot would remain stationary regardless of how sophisticated its sensors or software algorithms might be.

4. (C) LiDAR
   Mobile navigation relies on high-resolution mapping of the surrounding environment to avoid obstacles and plan paths. By emitting rapid pulses of laser light and measuring the time it takes for them to bounce back, a system can create a detailed three-dimensional point cloud. This data is essential for autonomous vehicles to understand terrain and identify objects in real-time.

5. (B) Roll, pitch, yaw
   Describing the orientation of an object in three-dimensional space requires defining its rotation around three distinct axes. These movements describe the tilting forward or backward, the side-to-side rotation, and the turning left or right. Mastering these rotational degrees of freedom is critical for stabilizing flight in drones and ensuring precision in the movement of robotic arms during complex tasks.

6. (A) 3, 2, 1, 5, 4
   Civilian aircraft regulations in India classify unmanned aerial systems based on their total weight including payload. The hierarchy starts with the smallest units weighing less than two hundred fifty grams and progresses through categories for lightweight, mid-sized, and heavy industrial platforms. This classification ensures appropriate safety standards and licensing requirements are applied based on the potential risk posed by each drone size.

7. (B) Rossum's Universal Robots
   The term used to describe artificial laborers originated in a twentieth-century science fiction play. This literary work introduced the concept of synthetic workers manufactured to serve humanity, eventually leading to a global adoption of the specific word for automated machines. The play explores the philosophical and societal implications of creating life-like entities, setting the stage for modern robotics and artificial intelligence.

8. (B) End effector
   The final component of a robotic manipulator is designed to perform specific tasks through direct interaction with the environment. Depending on the application, this unit might be a specialized gripper, a welding tool, or a precision spray nozzle. It serves as the interface where the robot's mechanical movements are converted into productive work, such as picking items or joining parts.

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layers, offering a fundamentally different approach to production.

44. (D) CAD (Computer-Aided Design)
The initial stage of modern manufacturing involves creating a detailed digital blueprint of a product. This software allows engineers to build three-dimensional models, test mechanical properties, and refine the geometry before any physical material is touched. These digital designs serve as the foundation for the entire production process, providing the necessary data for simulation and manufacturing instructions for machines.

45. (C) Precision agriculture
Modern farming integrates satellite data, sensors, and automated machinery to manage crops at a granular level. By applying water, fertilizer, and pesticides only to the specific areas that need them, farmers can maximize efficiency and reduce waste. This data-driven approach to land management helps improve overall sustainability and ensures that resources are used in the most effective manner possible.

46. (B) Hanson Robotics
A specialized laboratory focused on social robotics created a world-famous humanoid known for its ability to mimic human expressions and engage in conversation. This robot utilizes artificial intelligence and facial recognition to interact with people in a natural way. The project aims to explore the potential for robots to serve as companions, educators, and service providers in various social settings.

47. (B) Ultraviolet-C (UV-C) light
Hospitals utilize autonomous mobile platforms to maintain high levels of cleanliness and safety. These machines emit a specific wavelength of light that is capable of penetrating the outer membranes of microorganisms and disrupting their genetic material. This process effectively neutralizes bacteria and viruses on surfaces and in the air, providing a thorough and chemical-free method for disinfecting medical environments.

48. (B) UiPath
Selecting the right software platform is essential for implementing digital automation within an organization. One of the most prominent tools in the market allows users to design and deploy software robots that can handle repetitive office tasks across various applications. This platform provides a visual interface for creating workflows, making it easier for businesses to automate their complex administrative processes.

49. (A) Closed-loop control system
Precision machining requires constant monitoring to ensure that the cutting tool is exactly where it is programmed to be. Systems that use sensors to measure the actual position and feed that data back to the controller are capable of making real-time adjustments. This feedback mechanism corrects for any errors caused by mechanical wear or external forces, ensuring high accuracy.

50. (C) A central database that integrates all business processes
Organizations rely on comprehensive software solutions to manage their daily operations across different departments. This system acts as a single source of truth, connecting finance, human resources, supply chain, and manufacturing data in one place. By centralizing information, the system enables better decision-making and ensures that every part of the business is working with the same updated data.

51. (D) Daksh
Safety in hazardous operations is enhanced through the use of specialized remotely operated vehicles. India's defense research organization developed a rugged platform designed to handle dangerous objects and survey suspected explosive sites. The robot features a multi-jointed manipulator and multiple cameras, allowing security personnel to operate from a safe distance while performing high-risk inspections and disposal tasks.

52. (D) Software that mimics human actions within digital systems
Digital transformation often involves automating the interactions between different software applications. This technology uses programmed scripts to perform tasks such as logging into accounts, moving files, and filling out forms, exactly as a human would. It is widely used in industries like finance and healthcare to handle

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halts all movement, which eliminates the need for traditional steel cages and allows for closer human proximity.

18. (A) Payload capacity
Every industrial manipulator is designed with a specific limit regarding the mass it can move. This rating accounts for the weight of the end tool and the object being handled, ensuring that the robot maintains its accuracy and does not strain its motors. Staying within this weight limit is essential for preventing mechanical wear and ensuring high-quality production results.

19. (D) ISO/TS 15066
International standards provide the necessary guidelines for ensuring the safe operation of robots that work alongside humans. A specific technical specification defines the safety requirements for collaborative systems, including force and pressure limits during contact. These rules help manufacturers design workstations where humans and machines can interact without risk of injury, providing a standardized framework for global industrial safety.

20. (A) Proportional Integral Derivative
Control systems in robotics use a mathematical feedback loop to maintain precision and stability. This mechanism continuously calculates the difference between a desired setpoint and the actual measured position, adjusting the output based on current, past, and predicted future errors. By balancing these three components, the system can achieve smooth, accurate movements and quickly recover from any external disturbances.

21. (C) To regulate the speed and direction of the electric motors
Flight stability in multi-rotor aircraft is achieved by precisely managing the rotation of each propeller. A dedicated electronic component acts as the intermediary between the flight controller and the motors, converting DC power into the signals needed to vary motor RPM. This precise control allows the drone to hover, tilt, and change direction with extreme speed and high accuracy.

22. (B) Selective Compliance Assembly Robot Arm
High-speed assembly tasks often require a robot that is rigid in the vertical direction but slightly flexible in the horizontal plane. This unique design allows the machine to compensate for small misalignments when inserting parts into holes or slots. Such robots are widely used in electronics manufacturing and automotive parts assembly due to their speed and specialized mechanical properties.

23. (C) 6
The mobility of a rigid body in three-dimensional space is defined by its ability to move and rotate. To fully describe its position and orientation, one must account for movement along three linear directions and rotation around three corresponding axes. These combined parameters represent the total independent ways an object can maneuver within a three-dimensional environment without any physical constraints.

24. (D) Simultaneous Localization and Mapping
For a robot to navigate an unknown environment, it must build a map of its surroundings while simultaneously tracking its own position within that map. This complex computational problem is solved using data from various sensors to identify landmarks and update the robot's coordinates. This capability is fundamental for autonomous vacuum cleaners, self-driving cars, and exploration rovers in remote areas.

25. (B) Stepper motor
Industrial robotic systems are composed of various subsystems, including those used for movement and those used for manipulation. While grippers using vacuum, magnets, or mechanical fingers are designed to hold and move objects, other components serve as the power source for precise incremental motion. Understanding the difference between a tool that interacts with parts and the motor that drives it is essential.

26. (D) To process environmental data and direct the system's actuators
The central processing unit of a robot acts as its brain, receiving information from various sensors and making decisions based on programmed logic. Once the data is analyzed, the system sends specific commands to the motors and other movement-producing components. This coordination ensures that the robot performs its intended tasks accurately while responding

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9. (B) AGVs rely on pre-defined paths like magnetic strips or wires, while AMRs navigate dynamically using sensors and maps.
Automated logistics systems differ in their methods of navigation and environmental adaptation. Older technologies typically follow fixed tracks or markers installed in the floor, making them rigid in their operations. In contrast, modern autonomous units utilize advanced sensors to create internal maps, allowing them to reroute around obstacles and change paths without needing physical infrastructure modifications within the facility.

10. (C) A system capable of producing a variety of parts with virtually no time lost for changeovers
Advanced manufacturing systems are designed to handle high levels of product variation without significant downtime. This capability is achieved through programmable hardware and software that can switch between different tasks seamlessly. Such systems allow businesses to respond quickly to changing market demands or customized orders, maintaining high productivity while producing a diverse range of items on a single line.

11. (D) ROVs are physically tethered to a surface ship, while AUVs operate independently without a tether.
Deep-sea exploration utilizes different types of submersible technology depending on the mission requirements. Some vehicles are controlled by operators on the surface via a physical cable that provides power and data transmission. Other platforms are programmed to follow a specific path or complete tasks without any physical connection to a support ship, relying on internal power and intelligence.

12. (C) P-4, Q-2, R-3, S-1
Sensing components are vital for robotic perception and navigation. Mechanisms that detect physical contact manage interactions, while non-contact units identify nearby obstacles to prevent collisions. Visual systems provide complex image data for identification, and inertial units track orientation and angular velocity. Combining these diverse inputs allows a robotic system to understand its surroundings and maintain stability during various movement-based operations.

13. (A) Atmospheric pressure difference
Lifting delicate or flat materials often requires a method that does not rely on mechanical pinching. By removing air from a specialized cup, a low-pressure zone is created inside, while the external environment exerts higher force. This difference in pressure holds the object securely against the tool, allowing for efficient transport of items like glass sheets or electronic components.

14. (C) Lead-through programming
Teaching a robot a specific path can be accomplished by physically guiding the arm through the required sequence of movements. During this process, the controller records every position and joint angle in real-time. This intuitive method allows operators to program complex motions without writing extensive code, making it particularly useful for tasks like spray painting or adhesive application in manufacturing.

15. (D) Beyond Visual Line of Sight
Drone operations are categorized based on the distance between the pilot and the aircraft. Advanced missions often require the unmanned vehicle to travel to areas where it can no longer be seen by the naked eye. Regulatory frameworks establish specific protocols for these extended flights to ensure safety and coordination in airspace, particularly for delivery services and large-scale infrastructure mapping.

16. (A) Joseph Engelberger
The industrial revolution of the mid-twentieth century was marked by the introduction of the first programmable mechanical arm. A visionary engineer and entrepreneur collaborated to bring this technology to the factory floor, fundamentally changing how automobiles were manufactured. His contributions to the commercialization and standardization of robotic technology earned him a prestigious title as a founding figure in the field.

17. (A) Both A and R are true and R is the correct explanation of A.
The safety of human-robot collaboration is grounded in the ability of the machine to react to its environment. By integrating sensitive feedback mechanisms, these robots can detect even slight resistance during their motion. If a collision is imminent or occurs, the system immediately

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35. (A) A virtual representation of a physical system for monitoring
Modern manufacturing uses sophisticated digital models that mirror the real-time status of physical machinery. These simulations are fed with data from sensors on the actual equipment, allowing engineers to monitor performance, predict maintenance needs, and test changes without interrupting production. This integration of the physical and digital worlds is a cornerstone of smart factory initiatives and improves overall operational efficiency.

36. (A) Identifying weeds via vision for selective removal or spraying
Precision farming utilizes advanced vision systems to distinguish between desirable crops and invasive plants. By recognizing the specific patterns and shapes of different species, robotic systems can apply herbicides only where needed or use mechanical tools to remove pests. This targeted approach significantly reduces the total volume of chemicals used in agriculture, protecting the environment while maintaining high crop yields.

37. (A) Explosive ordnance disposal (bomb disposal)
Ground-based robotic platforms are frequently deployed in situations where the risk to human life is extremely high. These vehicles can be controlled from a safe distance to inspect suspicious objects or neutralize explosive threats. Equipped with cameras and specialized manipulators, they allow security personnel to perform dangerous tasks with precision, keeping humans away from the immediate blast zone.

38. (D) 3D printing
Manufacturing processes that build objects by joining materials layer upon layer are grouped under a specific technical category. Unlike traditional methods that remove material from a solid block, this approach adds material only where it is needed. This technology allows for the creation of complex geometries that would be impossible to manufacture using conventional milling or casting techniques in industry.

39. (D) Exoskeletons
Wearable mechanical frames are used to enhance the physical capabilities of the wearer or assist in medical recovery. These devices use sensors to detect the user's intended movement and provide motorized assistance to the limbs. They are particularly valuable for helping patients with paralysis relearn how to walk and for reducing physical strain on workers who perform heavy lifting tasks.

40. (D) It automates data extraction and entry into banking systems
Financial institutions handle massive amounts of customer documentation that must be verified and recorded. Software robots can be programmed to scan these documents, pull out relevant information, and input it into the bank's core databases. This automation speeds up the onboarding process for new clients, reduces the likelihood of manual entry errors, and ensures compliance with strict regulations.

41. (A) Both A and R are true and R is the correct explanation of A.
Robotic surgical systems function by bridging the gap between a surgeon's expertise and the patient's body. The surgeon operates from a separate station, and their gestures are captured and scaled down to operate tiny instruments. This setup provides a highly stable and magnified view of the surgical site, allowing for movements that are more precise than what is humanly possible.

42. (C) ISRO
India's national space agency has developed a sophisticated humanoid to test life-support systems in microgravity environments. This robotic entity is designed to simulate human functions and interact with the cockpit controls of future spacecraft. By sending this robot on test flights, the agency can collect vital data to ensure the safety and success of upcoming manned missions into orbit.

43. (B) Subtractive removal of material versus additive layer building
Two major manufacturing philosophies define how parts are shaped from raw materials. One method involves taking a solid block of metal or wood and using cutting tools to shave away excess material until the final shape is achieved. The other method involves creating an object from scratch by depositing material in successive

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95. A hypothetical organism or entity comprising both artificial (electronic/mechanical) and natural (biological) components is defined as a:
(A) Cyborg
(B) Android
(C) Humanoid
(D) Golem

96. Identify the correct statement regarding Computer Integrated Manufacturing (CIM).
(A) Applying strictly to the high-speed packaging phase only
(B) Integrating all enterprise operations using a shared database
(C) Automating production while keeping administration isolated
(D) Applicability solely restricted to the semiconductor industry

97. Consider the following statements regarding the "Big Four" industrial robotics companies globally:
I. FANUC is known for its yellow robots and CNC systems.
II. ABB Robotics is headquartered in Switzerland.
III. KUKA, originally a German company, was acquired by the Chinese firm Midea Group.
IV. Yaskawa Electric Corporation is a major player known for its Motoman industrial robots.
V. All of the "Big Four" companies originated in the United States.
Which of the above statements is/are correct?
(A) I, II, III, and IV only
(B) I, III, IV, and V only
(C) II, IV, and V only
(D) I, II, and V only

98. Consider the following statements regarding Indian robotics startups:
I. The Indian robotics ecosystem is primarily supported by government defense contracts with zero private investments.
II. Startups like IdeaForge specialize in manufacturing UAVs (drones) for defense and industrial applications.
III. Due to high labor supply, there is no demand for warehouse automation startups in India.
IV. Indian agritech startups are developing robots for pesticide spraying and crop monitoring.
Which of the above statements is/are correct?
(A) I and II only
(B) II and IV only
(C) I, III, and IV only
(D) II, III, and IV only

99. The tool holding device on a CNC milling machine that rotates to cut material is called the:
(A) Bed
(B) Coolant pump
(C) Gantry
(D) Spindle

100. Which of the following represents the correct sequence of signal processing stages in a Brain-Computer Interface (BCI) used to control a robotic limb?
(A) Signal Acquisition → Brain Activity Generation → Feature Extraction → Output Command
(B) Brain Activity Generation → Signal Acquisition → Feature Extraction → Output Command
(C) Output Command → Feature Extraction → Signal Acquisition → Brain Activity Generation
(D) Feature Extraction → Brain Activity Generation → Signal Acquisition → Output Command

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high volumes of repetitive data entry and administrative work with extreme speed.

53. (C) Integration of Cyber-Physical Systems, IoT, and cloud computing
The latest era of industrial development is defined by the convergence of digital and physical technologies. Factories are becoming smarter by connecting machines to the internet and using advanced data analytics to optimize production. This interconnection allows for decentralized decision-making and real-time monitoring, leading to more efficient, flexible, and responsive manufacturing environments that can adapt to changing demands automatically.

54. (C) Capsule endoscopy
Medical diagnostics have been revolutionized by the development of miniature imaging devices that can travel through the body. A patient swallows a small, pill-shaped unit that contains a camera, light source, and transmitter. As it moves through the digestive system, it captures thousands of images, providing doctors with a detailed view of areas that are difficult to reach.

55. (A) Fused Deposition Modeling (FDM)
One of the most common methods for creating 3D objects involves heating a plastic wire until it becomes soft and then precisely extruding it onto a platform. The material cools and hardens almost immediately, forming a solid layer. By repeating this process layer by layer, the machine builds a complete three-dimensional part, making it a popular choice for rapid prototyping.

56. (A) ASIMO
A major Japanese automotive company spent decades developing a bipedal robot that could walk, run, and interact with people. This humanoid was a marvel of engineering, featuring advanced balance systems that allowed it to navigate stairs and uneven surfaces. It served as a global ambassador for robotics, demonstrating how future machines might one day help people in their daily lives.

57. (A) Fully autonomous AI decision engine
Robotic surgical platforms are designed to assist doctors, not replace them. These systems consist of a control station for the surgeon, a set of robotic arms to hold instruments, and a high-definition vision system. The surgeon remains in total control of every movement, using the robot's precision to perform delicate tasks that would be challenging with traditional manual techniques alone.

58. (A) Cause and Effect relationship driving digital automation
The adoption of new technology in the financial sector is often triggered by specific operational challenges. When banks face massive amounts of data and strict government rules, they must find ways to ensure accuracy and speed. This pressure leads directly to the implementation of automated systems that can handle complex reconciliations, showing how environmental demands force technological evolution in business.

59. (A) 3D CAD Modeling → STL File Generation → Slicing → G-Code → Printing
Creating a physical object from a digital file requires a specific set of steps. First, a three-dimensional model is designed on a computer. This model is then converted into a format that describes its surface geometry. Next, software breaks the model into thin horizontal layers and generates the specific instructions the machine needs to follow to build each layer sequentially.

60. (A) I and II only
Smart manufacturing relies on the constant exchange of data between machines and the cloud. By using the internet to connect equipment, factories can monitor performance and predict when a component might fail. This allows for proactive maintenance before a breakdown occurs. While these systems are highly advanced, they still depend on sophisticated data analysis rather than purely mechanical principles.

61. (A) Identifying weeds via vision for selective removal or spraying
Modern agricultural robots use cameras and artificial intelligence to distinguish between crops and weeds. By recognizing the unique visual characteristics of different plants, these machines can target invasive species with extreme precision. This allows for the localized application of herbicides or mechanical destruction of weeds, which dramatically reduces the overall use of chemicals and promotes healthier environmental practices.

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(D) Insider threat

27. State-sponsored cyber attacks are primarily distinct from regular cyber crime because they usually focus on:
(A) Cyber espionage and disruption of critical infrastructure
(B) Immediate financial extortion using encryption ransomware
(C) Stealing personal credit card info from retail customers
(D) Defacing public-facing websites for personal notoriety

28. Consider the following statements regarding specific types of social engineering attacks:
I. Spear phishing involves sending generic emails to a massive number of users.
II. Whaling is a specialized phishing attack directed at high-profile targets like CEOs.
III. Smishing utilizes SMS messages to trick victims into revealing sensitive information.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

29. The term "Window of Vulnerability" in the context of zero-day threats refers to what time frame?
(A) Time between creating malware and its initial deployment
(B) Time between a software's release and its first update
(C) Time between flaw discovery and application of a patch
(D) Time spent by an attacker inside a compromised network

30. What is the primary difference between a Denial of Service (DoS) attack and a Distributed Denial of Service (DDoS) attack?
(A) DoS targets system hardware, whereas DDoS targets system software
(B) DoS aims to steal user data, whereas DDoS aims to encrypt user data
(C) DoS requires physical access, whereas DDoS is performed remotely
(D) DoS uses one source, whereas DDoS uses multiple compromised sources

31. In an asymmetric encryption system, if Person A wants to send a secure, confidential message to Person B, which key should Person A use to encrypt the message?
(A) Person A's public key
(B) Person A's private key
(C) Person B's public key
(D) Person B's private key

32. Virtual Private Networks (VPNs) often use which protocol suite to encrypt IP packets and provide secure tunneling over the internet?
(A) ICMP
(B) IPsec
(C) DHCP
(D) SMTP

33. In the context of encryption, what is the term used to describe data that has been transformed into an unreadable format?
(A) Plaintext
(B) Ciphertext
(C) Cleartext
(D) Hash

34. Match the following cyber forensics concepts in List-I with their descriptions in List-II.
List I: (Cyber Forensics Concepts)
P. Chain of Custody
Q. Write Blocker
R. Hashing
S. Volatile Data
List II: (Descriptions)
1. Data that is lost when power is removed
2. A tool that prevents modification of evidence during acquisition
3. Chronological documentation showing the seizure and handling of evidence
4. A method used to verify the integrity of a disk image
(A) P-4, Q-1, R-3, S-2
(B) P-2, Q-3, R-1, S-4
(C) P-3, Q-4, R-2, S-1
(D) P-3, Q-2, R-4, S-1

35. By default, which network port is used for secure communication over HTTPS?
(A) Port 443
(B) Port 21
(C) Port 80
(D) Port 25

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71. (A) P-2, Q-1, R-4, S-3
The intersection of technology and philosophy involves many complex topics. Discussions range from the legal status of intelligent machines to the presence of unfairness in software algorithms. Other areas include the design of machines that can make moral choices and the potential for a future where technology advances so rapidly that it permanently changes human civilization and its fundamental structure.

72. (B) Pragyan
India's successful lunar mission included a mobile laboratory designed to explore the surface of the Moon. This six-wheeled vehicle was deployed after a soft landing and was tasked with analyzing the chemical composition of the lunar soil. By moving across the terrain, it provided scientists on Earth with valuable data about the Moon's history and potential resources for future exploration.

73. (B) 10^{-9} meters
Engineering at the smallest scales requires working with dimensions that are invisible to the naked eye. A single unit at this level represents one-billionth of a meter. To put this in perspective, it is thousands of times smaller than the diameter of a human hair. Mastering this scale is essential for developing new materials and microscopic machines for advanced medical treatments.

74. (C) Affective computing
Creating machines that can understand and respond to human feelings is a specialized field of research. These systems use sensors to detect changes in facial expressions, voice patterns, and physical state to determine a person's emotional condition. This technology allows for more natural interactions between humans and computers, making robots better suited for roles in healthcare, education, and customer service.

75. (D) Asia-Pacific Broadcasting Union
Regional engineering contests foster innovation and collaboration among university students. A major annual competition in the Asia-Pacific region challenges teams to design and build robots that can complete specific tasks on a game field. This event is organized by a large association of broadcasters, highlighting the role of media in promoting science and technology education across many different countries.

76. (D) Perseverance Rover
Exploration of the Red Planet reached a new milestone with the arrival of a sophisticated robotic mission. This explorer carried a small helicopter to test the possibility of powered flight in the thin Martian atmosphere. By acting as a base station and communications link, the rover enabled the successful deployment and operation of the first aircraft to fly on another planet.

77. (B) II only
Robotic systems inspired by collective biological behavior are designed to be extremely resilient. One of their primary strengths is that they do not depend on any single individual to function. If one unit fails or is destroyed, the remaining members of the group can continue the task without interruption. This decentralized nature is a key advantage for missions in unpredictable environments.

78. (D) Snake robots
Navigating through the unstable rubble of a collapsed building requires a robot with a highly flexible and slender body. Designs that mimic the movement of certain reptiles can slither through narrow gaps and climb over obstacles that would stop a wheeled or legged robot. These machines are equipped with sensors to help search for survivors in dangerous disaster zones.

79. (B) DNA origami
Nanotechnology researchers have developed a method to create complex structures by folding genetic material. By precisely designing the sequence of the molecules, they can force them to self-assemble into specific two and three-dimensional shapes. This technique provides a way to build tiny containers and components for nanorobots, which could eventually be used to deliver medicine inside the human body.

80. (B) IV only
Robotic systems are essential for managing disasters, but they are not yet fully independent. While they can enter dangerous areas like radiation zones or collapsed buildings to search for survivors, they still require human operators to monitor their data and make critical decisions.

62. (A) Targeted drug delivery to specific cancer cells
Technology at the molecular scale offers revolutionary possibilities for healthcare. Scientists are developing microscopic machines that can travel through the bloodstream to deliver medication directly to diseased tissues. This approach minimizes the side effects often associated with traditional treatments by ensuring that powerful drugs only interact with the intended target, such as a tumor, while leaving healthy cells unharmed.

63. (A) I, II, and III only
Technology in farming has advanced to include visual ripening detection, aerial health monitoring, and satellite-guided machinery. These tools allow for centimeter-level precision in fieldwork and comprehensive assessments of large areas from the sky. While these advancements significantly improve efficiency and reduce the need for manual labor, they require a high level of technical integration to function effectively in modern agriculture.

64. (C) NASSCOM
India's push for digital literacy and specialized skills is supported by partnerships between the government and industry bodies. A major initiative focuses on training professionals in emerging fields like artificial intelligence and robotics. By collaborating with a prominent trade association representing the technology sector, the government ensures that the training programs meet the actual needs of the modern workforce.

65. (A) Uncanny Valley
There is a psychological phenomenon where people feel comfortable with robots that look clearly mechanical or very human. However, when a robot looks almost human but has slight imperfections, it often creates a sense of unease or disgust. This concept is a major consideration for designers working on humanoid robots intended for social interaction and entertainment in various public settings.

66. (A) Warehouse automation and supply chain robotics
Efficient logistics are crucial for the growth of e-commerce and global trade. An Indian technology firm has become a leader in this space by developing autonomous mobile robots that can sort, move, and manage inventory in large distribution centers. These systems help companies process orders much faster and with greater accuracy, transforming how goods are handled from arrival to shipment.

67. (C) UCAV (Unmanned Combat Aerial Vehicle)
Military technology has evolved to include aircraft that can perform offensive missions without a pilot on board. These platforms are equipped with sensors for surveillance and weapons systems for engaging targets. Operating these vehicles remotely allows for high-risk missions to be conducted without putting flight crews in danger, and they have become a significant part of modern aerial warfare strategies.

68. (B) The robots rely on decentralized control and local communication to accomplish tasks.
Large groups of simple robots can work together to achieve complex goals by mimicking the behavior of social animals. In these systems, there is no single leader; instead, each individual follows simple rules and interacts with its immediate neighbors. This collective approach makes the entire group very robust, as the loss of a few individuals does not stop the mission.

69. (A) Trolley Problem
Ethical programming for autonomous machines involves making difficult decisions in life-threatening situations. A classic thought experiment asks how a machine should choose when all available options result in harm. This problem is central to the development of self-driving cars, as engineers and philosophers must determine the logic the vehicle should use when faced with unavoidable accidents or collisions.

70. (B) Robot Operating System
Developing complex robotic software is simplified by using a standardized framework that provides tools and libraries for common tasks. This open-source platform allows researchers and engineers to share code and collaborate on different parts of a project, such as navigation, perception, and control. It has become the most widely used software ecosystem in both academic research and industrial robotics development.

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most important rule states that a robot's highest priority must be the safety of people. It must not only avoid causing direct harm but also act to prevent a person from being hurt by any external circumstances or dangers.

90. (A) Social insects like ants and bees
Engineers often look to nature for ways to manage large numbers of individual units. By observing how colonies of small creatures work together to find food and build nests, researchers have developed algorithms for robotic groups. These systems rely on simple interactions between individuals to produce intelligent collective behavior, making them very effective for tasks that require many low-cost robots working together.

91. (B) P-3, Q-4, R-2, S-1
The global market for industrial machinery is led by several major firms located in different parts of the world. Key players include a Japanese company famous for its precision control, a German firm known for automotive solutions, and an American laboratory focused on advanced locomotion. Additionally, a Swiss-Swedish conglomerate is a major provider of power and automation technologies across many diverse industrial sectors.

92. (C) Computer Numerical Control
Modern machine tools are operated by programmed instructions rather than manual movements. This technology allows a computer to control the speed, position, and path of a cutting tool with extreme accuracy. By using this system, manufacturers can produce complex parts that are identical every time, which is essential for high-volume production in industries like aerospace and automotive manufacturing.

93. (D) Northwestern University
The concept of a robot designed to assist and work safely with people was developed through academic research. A team at a prominent American university pioneered the idea of machines that would not be isolated behind cages but would instead share the workspace with human colleagues. This research laid the groundwork for a new generation of robots that are now common in manufacturing.

94. (C) Evolutionary robotics and self-healing systems
Advanced research explore machines that can adapt and improve over time without human help. This involves software that can rewrite itself to solve new problems or hardware that can detect and repair its own physical damage. These capabilities are inspired by biological processes and could eventually lead to robots that are much more resilient and capable of working in remote, harsh environments.

95. (A) Cyborg
The merger of biological and technological components creates a unique type of entity. This involves integrating electronic or mechanical parts into a living organism to enhance its capabilities or restore lost functions. While often seen in science fiction, real-world examples include people using advanced prosthetic limbs or medical implants, representing the growing connection between human biology and modern engineering.

96. (B) Integrating all enterprise operations using a shared database
Modern production is most effective when every part of the company is connected. By using a single database to link design, manufacturing, and business management, an organization can ensure that everyone is working with the same information. This integration allows for faster response times to customer orders and better coordination across the entire factory, leading to higher efficiency and reduced waste.

97. (A) I, II, III, and IV only
The worldwide industrial machinery market is dominated by a few key organizations. These firms, which originated in Japan, Europe, and Switzerland, specialize in different areas such as high-speed assembly, heavy lifting, and advanced control software. While they all have a global presence, they are distinguished by their unique technical specialties and the specific colors and designs of their robotic arms.

98. (B) II and IV only
India's technology ecosystem features a growing number of innovative firms focused on autonomous systems. These companies are developing unmanned aircraft for defense and

This human-in-the-loop approach ensures that the robots are used effectively and safely during complex and high-stakes rescue missions.

81. (C) Migrating data from a legacy spreadsheet to a cloud database
Digital automation focuses on streamlining business processes by using software to handle information. Unlike physical machines that move objects, these digital tools work entirely within computer systems. A classic example is the automated transfer of large amounts of data between different software platforms, which saves time and prevents the errors that often occur when humans perform manual data entry.

82. (A) P-2, Q-4, R-3, S-1
India has developed a variety of unmanned platforms for national security and exploration. These include long-endurance aircraft for monitoring borders, rugged ground vehicles for neutralizing explosives, and humanoid designs for testing space environments. Additionally, lightweight aerial units are used for tactical surveillance. Each system is tailored to meet the specific demands of its operating environment, from the battlefield to outer space.

83. (D) Baby harp seal
Therapeutic robots are often modeled after animals to encourage emotional bonding with patients in hospitals and care homes. One famous example resembles a marine mammal known for its white fur and large eyes. This robot responds to touch and sound, providing comfort and reducing stress for elderly patients and those with dementia, demonstrating the value of social robotics in modern healthcare.

84. (C) Job polarization
The introduction of automation into the workforce has changed the types of jobs available. Tasks that are repetitive and follow a set of rules are increasingly being handled by machines. This has led to a market where there is high demand for both very high-skilled and very low-skilled workers, while middle-income routine jobs are becoming less common in the modern economy.

85. (C) Indirect coordination through modification of the environment
Coordination in large groups of simple agents can occur without any direct communication. By leaving marks or changing the surroundings, one individual can influence the behavior of others who come across that spot later. This method of communication, commonly seen in ant colonies, allows a robotic swarm to complete complex tasks like building structures or searching an area through collective intelligence.

86. (B) Radioisotope Thermoelectric Generators (RTG)
Spacecraft traveling far from the Sun or operating in dusty environments cannot depend on light for energy. Instead, they use a power source that converts the heat generated by the natural decay of radioactive material into electricity. This provides a reliable and long-lasting supply of power, allowing robotic explorers to function for many years in the harsh conditions of other planets.

87. (B) FIRST Robotics Competition
International student challenges inspire the next generation of engineers by providing hands-on experience in building complex machines. One well-known program requires teams to design and program robots to play a specific game against other teams. These events emphasize teamwork, creativity, and technical skills, helping students learn about mechanical design, electronics, and software development in a competitive and exciting environment.

88. (C) LEGO Mindstorms
Educational tools often use a visual approach to teach the basics of technology. By using blocks of code that snap together like puzzle pieces, beginners can learn to control motors and sensors without needing to master complex text-based languages. This makes the field accessible to children and hobbyists, allowing them to build and program their own functional robots from a young age.

89. (B) Preventing injury to humans or allowing harm through inaction
The ethical foundation of human-machine interaction was famously described in a set of rules created by a science fiction author. The

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CHAPTER 21

Cyber Security and Data Protection

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1. What is the primary mechanism by which ransomware affects a victim's computer system?
(A) It records keystrokes to steal sensitive login credentials
(B) It floods target servers with traffic to cause a service denial
(C) It installs hidden backdoors for unauthorized remote access
(D) It encrypts system data to demand payment for decryption

2. Cross-Site Scripting (XSS) attacks primarily target which component of a web application environment?
(A) The database server
(B) The web server configuration
(C) The user's web browser
(D) The firewall rules

3. Which type of threat actor is primarily motivated by ideological or political goals rather than financial gain?
(A) Script kiddie
(B) Cyber criminal
(C) Hacktivist
(D) Insider threat

4. Match the cyber security terms in List-I with their correct descriptions in List-II.
List I: (Security Terms)
P. Exploit
Q. Payload
R. Vulnerability
S. Threat
List II: (Descriptions)
1. A weakness in a system that can be leveraged
2. A potential danger that can compromise a system
3. Code or technique used to take advantage of a weakness
4. The malicious action or code delivered to the target
(A) P-1, Q-2, R-3, S-4
(B) P-4, Q-3, R-2, S-1
(C) P-3, Q-4, R-1, S-2
(D) P-3, Q-1, R-4, S-2

5. A cyber attacker drops infected USB drives in a corporate parking lot, hoping an employee will plug one into a company computer. What is this social engineering technique called?
(A) Tailgating
(B) Baiting
(C) Quid pro quo
(D) Pretexting

6. In the context of critical infrastructure protection, what does SCADA stand for?
(A) System Control and Digital Analytics
(B) Supervisory Control and Data Acquisition
(C) Secure Computing and Data Administration
(D) Standard Cyber Attack Detection Architecture

7. Which of the following best defines the primary objective of cyber security?
(A) To improve network performance and internet speeds
(B) To protect systems from unauthorized access or damage
(C) To secure physical hardware components in data centers
(D) To monitor the geographic location of all global users

8. In which type of attack does a malicious actor secretly intercept and potentially alter the communication between two parties who believe they are communicating directly with each other?
(A) Brute Force
(B) Man in the Middle
(C) Cross-site scripting
(D) SQL Injection

9. What distinguishes a dictionary attack from a brute force password attack?

(A) A dictionary attack tries every possible combination of characters, while brute force uses a predefined list of words
(B) A dictionary attack uses a list of common words and phrases, while brute force tries all possible character combinations
(C) A dictionary attack can only be used on offline files, while brute force is only for online portals
(D) A dictionary attack requires physical access to the device, while brute force is done remotely

10. Which of the following is the most appropriate distinction between spyware and adware?
(A) Spyware spreads through network replication, whereas adware relies on host file attachment
(B) Spyware is generally legally permissible, whereas adware is heavily penalized under law
(C) Spyware monitors users, whereas adware displays advertisements
(D) Spyware targets internal network hardware, whereas adware targets specific software apps

11. Consider the following statements regarding network security components:
I. A firewall monitors and controls incoming and outgoing network traffic based on predetermined security rules.
II. An Intrusion Detection System (IDS) can actively block malicious traffic.
III. An Intrusion Prevention System (IPS) both detects and actively blocks malicious activities.
IV. A proxy server acts as an intermediary for requests from clients seeking resources from other servers.
V. Firewalls can only be hardware-based appliances.
Which of the above statement(s) is/are incorrect?
(A) I and III only
(B) II and V only
(C) I, II, and IV only
(D) III, IV, and V only

12. Match the types of malware in List-I with their characteristic features in List-II.
List I: (Malware Types)
P. Virus
Q. Worm
R. Trojan
S. Ransomware
List II: (Characteristic Features)
1. Encrypts user files and demands payment
2. Disguises itself as legitimate software
3. Attaches to a host file to execute
4. Self-replicates across networks without a host file
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-2, R-4, S-1
(C) P-3, Q-4, R-2, S-1
(D) P-2, Q-4, R-3, S-1

13. An attacker inputs malicious code into a website's login form to manipulate the backend database and gain unauthorized access. This attack is known as:
(A) SQL Injection
(B) Cross-site scripting
(C) Session Hijacking
(D) Buffer Overflow

14. Which of the following is the core mechanism exploited in social engineering attacks?
(A) Software vulnerabilities
(B) Hardware malfunction
(C) Human psychology and trust
(D) Weak encryption algorithms

15. Stuxnet is widely recognized as one of the first state-sponsored cyber weapons. What was its specific target?
(A) Global financial banking networks
(B) Healthcare databases in North America
(C) The international SWIFT banking system
(D) Iranian nuclear enrichment centrifuges

16. The CIA triad is a foundational concept in cyber security. What does the acronym CIA stand for in this context?
(A) Confidentiality, Integrity, Availability
(B) Cyber, Intelligence, Analytics
(C) Control, Identity, Authorization
(D) Computing, Information, Access

17. Which of the following is a defining characteristic of an Advanced Persistent Threat (APT)?
(A) Long-term, stealthy access to a specific target network

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(B) Immediate and noticeable destruction of critical data
(C) Automated and untargeted dissemination of new malware
(D) Execution by novice hackers using basic off-the-shelf tools

18. A malicious software designed to secretly monitor and record the user's keystrokes is known as what?
(A) Keylogger
(B) Adware
(C) Logic Bomb
(D) Rootkit

19. Consider the following statements regarding zero-day vulnerabilities:
I. A zero-day vulnerability is a flaw that is unknown to the software vendor or for which no patch has yet been released.
II. An exploit targeting a zero-day vulnerability is called a zero-day exploit.
III. Antivirus signatures can easily detect and block zero-day exploits on day one.
IV. Zero-day attacks pose a significant risk because conventional security controls may not recognize them.
Which of the above statement(s) is/are correct?
(A) I, II, and IV only
(B) II, III, and IV only
(C) I, III, and IV only
(D) I, II, III, and IV

20. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): A Distributed Denial of Service (DDoS) attack can severely disrupt the availability of e-governance portals.
Reason (R): DDoS attacks flood the target server with an overwhelming volume of traffic generated by a botnet.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

21. Which of the following acts best describes cyber terrorism?
(A) Hacking a commercial bank to transfer funds to a private account
(B) Downloading copyrighted digital media via peer-to-peer networks
(C) Attacking critical infrastructure to intimidate a government entity
(D) Sending unsolicited commercial marketing emails in massive bulk

22. Which of the following statements about computer worms is correct?
(A) They need direct human intervention to spread between hosts
(B) They replicate automatically across networks without a host file
(C) They are mostly used for displaying unsolicited advertisements
(D) They only spread when a user opens infected email attachments

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23. An attacker calls a victim posing as a bank representative and convinces them to share their OTP. This is an example of which cyber attack?
(A) Phishing
(B) Smishing
(C) Pharming
(D) Vishing

24. A rainbow table is primarily used by attackers to accomplish which of the following tasks?
(A) To bypass biometric authentication
(B) To initiate a DDoS attack
(C) To inject SQL commands
(D) To crack password hashes efficiently

25. Which protocol vulnerability is most commonly exploited to execute a Man in the Middle (MitM) attack on a local network?
(A) BGP Hijacking
(B) ARP Spoofing
(C) SQL Injection
(D) Directory Traversal

26. An employee intentionally leaking confidential organizational data to a competitor is an example of which type of cyber threat?
(A) Advanced Persistent Threat
(B) Zero-day exploit
(C) State-sponsored attack

industrial monitoring, as well as specialized tools for modernizing agriculture. By creating products that address local challenges in security and farming, these startups are helping to drive the adoption of advanced technology across many different sectors of the economy.

99. (D) Spindle
In the heart of an automated milling machine, a critical component holds and rotates the cutting tool at very high speeds. This rotating shaft provides the power and precision needed to remove material from a workpiece. Maintaining the stability and speed of this component is essential for achieving a high-quality surface finish and ensuring that parts are machined to exact specifications.

100. (B) Brain Activity Generation → Signal Acquisition → Feature Extraction → Output Command
Controlling a machine with thought involves a sequence of technical processes. First, the user's brain generates electrical activity associated with a specific intent. Sensors then capture these signals, and specialized software analyzes the data to identify the intended movement. Finally, the system translates these identified patterns into a specific command that moves the robotic limb or a computer cursor.

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36. In Disaster Recovery planning, the Recovery Point Objective (RPO) refers to:
(A) Maximum acceptable data loss measured in time
(B) Maximum allowable time to restore operations
(C) Physical location of the backup data center
(D) Budget allocated for recovering from disaster

37. What is the fundamental difference between an Intrusion Detection System (IDS) and an Intrusion Prevention System (IPS)?
(A) IDS alerts administrators, while IPS automatically blocks threats
(B) IDS analyzes encrypted data, while IPS analyzes plaintext data
(C) IDS is deployed on endpoints, while IPS is strictly cloud-based
(D) IDS prevents viruses, while IPS prevents unauthorized user access

38. Authentication mechanisms are typically classified into three factors: something you know, something you have, and something you are. Which of the following represents "something you have"?
(A) A password
(B) A fingerprint
(C) A retina scan
(D) A smart card

39. What is the very first phase of a standard ethical hacking or penetration testing engagement?
(A) Exploitation
(B) Maintaining Access
(C) Covering Tracks
(D) Reconnaissance / Footprinting

40. Which of the following is NOT a standard component of a Public Key Infrastructure (PKI)?
(A) Certificate Authority (CA)
(B) Registration Authority (RA)
(C) Certificate Revocation List (CRL)
(D) Border Gateway Protocol (BGP)

41. Consider the following statements regarding the Cloud Security Shared Responsibility Model:
I. In an IaaS model, the customer is responsible for physical data center security.
II. In a SaaS model, the cloud provider manages the underlying infrastructure and application logic.
III. Customers are generally responsible for managing user access and identities across all cloud models.
IV. In a PaaS model, the customer manages the operating system.
V. Data security is always a shared or customer responsibility regardless of the cloud service model.
Which of the above statement(s) is/are correct?
(A) II, III, and V only
(B) I, III, and IV only
(C) II, IV, and V only
(D) I, II, and III only

42. Which of the following represents the correct sequence of steps in symmetric encryption?
(A) Plaintext → Public Key Encryption → Ciphertext → Private Key Decryption → Plaintext
(B) Ciphertext → Secret Key Encryption → Plaintext → Public Key Decryption → Ciphertext
(C) Plaintext → Secret Key Encryption → Ciphertext → Same Secret Key Decryption → Plaintext
(D) Plaintext → Hashing → Ciphertext → Secret Key Decryption → Plaintext

43. Which of the following biometric modalities relies on the unique pattern of blood vessels in the eye?
(A) Iris recognition
(B) Retina scan
(C) Facial recognition
(D) Palm print

44. Digital signatures provide security assurances. Which specific security concept prevents the sender of a digitally signed message from denying they sent it?
(A) Confidentiality
(B) Availability
(C) Obfuscation
(D) Non-repudiation

45. Which phase of the Incident Response process involves removing the malware and eliminating the threat from the environment?
(A) Preparation

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82. The ISO/IEC 27001 standard is globally recognized for providing requirements for which of the following?
(A) An Information Security Management System (ISMS)
(B) Hardware manufacturing quality control
(C) Broadband spectrum allocation
(D) Database query optimization

83. Which section of the IT Amendment Act, 2008 grants power to the Government to issue directions for interception, monitoring, or decryption of any information generated, transmitted, or stored in any computer resource?
(A) Section 66F
(B) Section 43A
(C) Section 72A
(D) Section 69

84. Under India's Digital Personal Data Protection (DPDP) Act, 2023, what is the term used for the entity (person, company, or government agency) that determines the purpose and means of processing personal data?
(A) Data Processor
(B) Data Principal
(C) Data Fiduciary
(D) Consent Manager

85. The National Cyber Security Policy of India (2013) aimed at creating a workforce of how many cyber security professionals over a period of 5 years?
(A) 1 Lakh
(B) 5 Lakhs
(C) 10 Lakhs
(D) 50 Lakhs

86. Mobile Device Management (MDM) solutions are utilized by organizations primarily to:
(A) Boost the battery life of employee smartphones
(B) Enforce policies and manage compromised devices
(C) Increase the cellular bandwidth of the device
(D) Intercept encrypted SMS on competitor networks

87. Which of the following is NOT a right granted to the Data Principal under the Digital Personal Data Protection Act, 2023?
(A) Right to access information about personal data
(B) Right to demand a share of profits generated from their data
(C) Right to correction and erasure of personal data
(D) Right to grievance redressal

88. Section 66A of the IT Act, which dealt with sending offensive messages through communication services, was struck down by the Supreme Court of India in which landmark case?
(A) K.S. Puttaswamy vs Union of India
(B) Shreya Singhal vs Union of India
(C) Anuradha Bhasin vs Union of India
(D) Navtej Singh Johar vs Union of India

89. The "Cyber Surakshit Bharat" initiative is a public-private partnership launched by the Ministry of Electronics and IT (MeitY) in collaboration with:
(A) NITI Aayog
(B) Private industry partners
(C) RBI
(D) The UN

90. CERT-In (Computer Emergency Response Team - India) functions under which Union Ministry?
(A) Ministry of Electronics and IT
(B) Ministry of Home Affairs (MHA)
(C) Ministry of Defence (MoD)
(D) Ministry of Science and Technology

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91. Identify the incorrect statement regarding modern cryptography:
(A) Hash functions are one-way and cannot be easily reversed
(B) Base64 encoding provides high security against attackers
(C) A salt is a random value added to a password hash input
(D) ECC provides security like RSA but with smaller key sizes

92. A major e-commerce platform suffers a massive data breach due to poor database security, leading to millions of leaked customer records.

(C) The cryptographic algorithms and session keys used for security
(D) The maximum bandwidth limit permitted for the current session

54. Which of the following is a key distinction between vulnerability assessment and penetration testing?
(A) Vulnerability assessment exploits flaws; pen testing identifies them
(B) Vulnerability assessment is illegal; pen testing is always ethical
(C) Assessment identifies weaknesses; pen testing simulates attacks
(D) Assessment targets hardware; pen testing targets software apps

55. In biometric security systems, what does the False Acceptance Rate (FAR) measure?
(A) Probability of incorrectly identifying an unauthorized user
(B) Probability that the system rejects an authorized user
(C) Speed at which the system processes biometric input data
(D) Rate at which biometric sensors fail over a period of time

56. Which mathematical concept is fundamentally used to convert plaintext into ciphertext in modern digital encryption?
(A) Cryptographic algorithms
(B) Network topologies
(C) Subnet masking
(D) Packet switching

57. In cyber forensics, what is the critical importance of maintaining a proper "Chain of Custody"?
(A) It ensures the evidence remains legally admissible in court
(B) It ensures the forensic software runs faster
(C) It decrypts the suspect's hard drive automatically
(D) It hides the identity of the digital investigator

58. Consider the following statements regarding SSL/TLS protocols:
I. TLS is the modern, more secure successor to SSL.
II. SSL/TLS operates primarily at the physical layer of the OSI model.
III. HTTPS relies on SSL/TLS to secure communication between a browser and a web server.
Which of the above statement(s) is/are correct?
(A) I and II only
(B) II and III only
(C) I and III only
(D) I, II, and III

59. In ethical hacking, what term describes a penetration testing method where the tester is given complete knowledge of the target network's infrastructure and source code?
(A) Black Box Testing
(B) Gray Box Testing
(C) White Box Testing
(D) Blind Testing

60. To create a digital signature, the sender must encrypt the hash of the message using which key?
(A) The sender's public key
(B) The sender's private key
(C) The receiver's public key
(D) The receiver's private key

61. The ISO 27001 standard follows the PDCA cycle for continuous improvement. What does PDCA stand for?
(A) Prevent, Detect, Contain, Assess
(B) Process, Data, Cyber, Analytics
(C) Plan, Do, Check, Act
(D) Protect, Defend, Control, Audit

62. The National Critical Information Infrastructure Protection Centre (NCIIPC) was established under which section of the Information Technology Act, 2000?
(A) Section 43A
(B) Section 69A
(C) Section 70A
(D) Section 79

63. In the context of mobile security, what does the term "sideloading" refer to?
(A) Installing an application from an unofficial source
(B) Encrypting data stored on a mobile device's SD card
(C) Transferring contact information via a Bluetooth link

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ANSWERS

1. (D) It encrypts system data to demand payment for decryption
Ransomware is a specialized form of malicious software designed to block access to a computer system or its files until a sum of money is paid. The malware uses cryptographic techniques to lock files, making them inaccessible to the legitimate user. Restoring access typically requires a decryption key provided only after the ransom payment is successfully completed.

2. (C) The user's web browser
Cross-site scripting represents a client-side vulnerability where attackers inject malicious scripts into trusted websites. These scripts execute within the context of a victim's web browser, allowing the perpetrator to bypass access controls, steal session cookies, or capture sensitive user information. This attack focuses on exploiting the trust a browser has in the scripts delivered by a legitimate site.

3. (C) Hacktivist
Hacktivists are individuals or groups who use digital tools and hacking techniques to promote a specific social, political, or ideological agenda. Unlike cybercriminals who primarily seek financial gain through theft or extortion, these actors focus on generating public awareness or disrupting services to protest against perceived injustices, government policies, or corporate actions they find objectionable or unethical.

4. (C) P-3, Q-4, R-1, S-2
Security management requires distinguishing between various risk components. A vulnerability represents an inherent weakness in a system, while a threat is the potential danger seeking to exploit it. An exploit is the specific method or code used to trigger the weakness, and the payload is the actual malicious activity or content delivered to the target computer system.

5. (B) Baiting
Baiting is a social engineering technique that leverages human curiosity or greed by leaving physical media, such as infected USB drives, in locations where targets will find them. Once a curious employee connects the device to a corporate computer, malicious software automatically installs, granting the attacker unauthorized access to the internal network and sensitive organizational data and systems.

6. (B) Supervisory Control and Data Acquisition
Supervisory Control and Data Acquisition systems are crucial for monitoring and controlling industrial processes in real-time. These architectures manage critical infrastructure sectors including power grids, water treatment plants, and manufacturing facilities. They gather data from remote sensors and send control commands to field devices, making their security vital for national safety and the continuous operation of essential public services.

7. (B) To protect systems from unauthorized access or damage
Cybersecurity encompasses the collective methods, technologies, and practices designed to safeguard computers, networks, and data from digital attacks or unauthorized exploitation. Its fundamental goal involves ensuring the confidentiality, integrity, and availability of information assets. By establishing robust defense mechanisms, organizations can prevent data breaches, service disruptions, and financial losses resulting from increasingly sophisticated and malicious cyber activities.

8. (B) Man in the Middle
A Man in the Middle attack occurs when a perpetrator positions themselves between two communicating entities to intercept and relay traffic. The participants remain unaware that their private conversation is being monitored or altered in real-time. This technique allows attackers to capture sensitive credentials, session tokens, or modify data packets before they reach the intended destination and recipient.

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73. Which of the following is a stated objective of the National Cyber Security Policy (2013)?
(A) Banning cryptocurrency trading
(B) Eliminating the use of foreign hardware in defense
(C) Imposing a blanket ban on the dark web
(D) Creating a secure cyber ecosystem in the country

74. Which specific section of the IT Act addresses the offense of voyeurism, penalizing the capturing or publishing of images of a person's private parts without their consent?
(A) Section 66B
(B) Section 66C
(C) Section 66E
(D) Section 67A

75. The Budapest Convention is the first binding international treaty focusing on which subject?
(A) Nuclear Non-Proliferation
(B) Climate Change
(C) International Trade Tariffs
(D) Cybercrime

76. Which of the following is a primary security risk associated with multitenancy in public cloud environments?
(A) High capital expenditure for physical server hardware
(B) Inability to access company data over the internet
(C) Automatic deletion of backups after a 30-day period
(D) Potential for cross-tenant leakage if isolation fails

77. In the context of the Digital Personal Data Protection Act, 2023, the term "Data Principal" refers to:
(A) The CEO of a tech company
(B) The regulatory authority overseeing data protection
(C) The database administrator
(D) The individual to whom the personal data relates

78. What was the primary objective of enacting the Information Technology Act, 2000 in India?
(A) To ban foreign social media platforms from operating in India
(B) To mandate free internet access for all citizens of the country
(C) To regulate the pricing of commercial broadband service providers
(D) To provide legal recognition for electronic transactions and crime

79. How is "Critical Information Infrastructure" (CII) defined under the IT Act, 2000?
(A) Any government website handling citizen grievances
(B) Infrastructure whose damage impacts national security
(C) Private corporate networks housing financial data
(D) Academic databases belonging to central universities

80. Match the following Indian cyber security organizations in List-I with their key functions in List-II.
List I: (Organizations)
P. CERT-In
Q. NCIIPC
R. I4C
S. NTRO
List II: (Key Functions)
1. Technical intelligence gathering agency
2. Protection of Critical Information Infrastructure
3. National nodal agency for responding to computer security incidents
4. Scheme to deal with cybercrimes collaboratively (under MHA)
(A) P-2, Q-3, R-1, S-4
(B) P-3, Q-4, R-2, S-1
(C) P-4, Q-2, R-3, S-1
(D) P-3, Q-2, R-4, S-1

81. What is India's official stance regarding the Budapest Convention on Cybercrime?
(A) India is a founding member and active signatory of the treaty
(B) India has signed the treaty but refused to formally ratify it
(C) India has not signed the treaty due to sovereignty concerns
(D) India withdrew from all treaty negotiations in early 2021

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common malware, these threats involve high levels of coordination and resources, prioritizing stealth and persistence over immediate, visible destruction.

18. (A) Keylogger
A keylogger is a type of surveillance software or hardware device used to record every stroke made on a keyboard. This malicious tool is often employed to steal sensitive information such as usernames, passwords, credit card numbers, and private messages. The captured data is typically sent to a remote server, allowing an attacker to gain unauthorized access to various accounts.

19. (A) I, II, and IV only
Zero-day vulnerabilities represent software flaws that are unknown to developers, leaving no time for a fix before an exploit occurs. Because these threats lack established signatures, traditional antivirus software often fails to detect them initially. This makes them highly dangerous, as attackers can bypass existing security controls until a patch is developed and deployed by the software vendor to mitigate risk.

20. (A) Both A and R are true and R is the correct explanation of A.
Distributed Denial of Service attacks utilize a network of compromised computers, known as a botnet, to overwhelm a target server with massive amounts of illegitimate traffic. This surge in requests exhausts the server's resources, making it unable to process legitimate user requests. Consequently, essential services like e-governance portals become unavailable, directly impacting the accessibility and reliability of public digital infrastructure.

21. (C) Attacking critical infrastructure to intimidate a government entity
Cyber terrorism involves the use of computer network tools to shut down critical national infrastructures, such as energy, transportation, or government operations. The primary motivation is to coerce or intimidate a government or civilian population to achieve political or social objectives. These acts differ from ordinary cybercrime because they focus on causing widespread alarm and physical or economic disruption for ideological reasons.

22. (B) They replicate automatically across networks without a host file
Computer worms are a distinct category of malware capable of self-replication and autonomous propagation across network connections. Unlike viruses, which must attach themselves to an existing executable program or host file to function, worms exploit system vulnerabilities to spread independently. This allows them to infect multiple machines rapidly without any direct human interaction or the need to open specific file attachments.

23. (D) Vishing
Vishing, or voice phishing, is a social engineering attack where criminals use phone calls to deceive victims into revealing sensitive personal or financial information. By masquerading as trusted entities like bank representatives, attackers exploit human emotions to obtain passwords or one-time tokens. This technique often employs caller ID spoofing to appear legitimate, making it a highly effective method for identity theft.

24. (D) To crack password hashes efficiently
A rainbow table is a precomputed table used for reversing cryptographic hash functions, primarily for cracking password hashes. Instead of calculating the hash for every possible password during an attack, the process references this table to quickly find the original plaintext associated with a specific hash value. This significantly reduces the time and computational power required to compromise user credentials in databases.

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25. (B) ARP Spoofing
Address Resolution Protocol spoofing is a technique where an attacker sends falsified ARP messages over a local area network. This links the attacker's MAC address with the IP address of a legitimate server or gateway. Once established, the attacker can intercept, modify, or stop data traffic intended for that IP, effectively placing themselves in the middle of the communication stream.

26. (D) Insider threat
An insider threat originates from individuals within an organization, such as current or former employees, contractors, or business partners, who have authorized access to the network and data.

Which of the following is the most direct cause-and-effect consequence for the company?
(A) Immediate increase in network bandwidth
(B) Automatic upgrade of their SSL certificates
(C) Severe financial penalties and loss of customer trust
(D) Hardware failure in user endpoints

93. Which cybersecurity role focuses heavily on analyzing log files, monitoring network traffic in real-time, and identifying anomalous behaviors indicating a breach?
(A) Security Architect
(B) GRC Manager
(C) Cryptographer
(D) SOC Analyst

94. Read the following statements regarding digital signatures and choose the correct option:
Statement I: Digital signatures utilize asymmetric cryptography.
Statement II: A digital signature ensures the confidentiality of the transmitted message.
Which of the following is correct?
(A) Both Statement I and Statement II are correct
(B) Both Statement I and Statement II are incorrect
(C) Statement I is correct but Statement II is incorrect
(D) Statement I is incorrect but Statement II is correct

95. Match the cyber attack in List-I with the corresponding targeted OSI model layer in List-II.
List I: (Cyber Attacks)
P. MAC Spoofing
Q. IP Spoofing
R. Port Scanning
S. HTTP Flood (DDoS)
List II: (OSI Layers)
1. Layer 7 (Application Layer)
2. Layer 4 (Transport Layer)
3. Layer 3 (Network Layer)
4. Layer 2 (Data Link Layer)
(A) P-4, Q-3, R-2, S-1
(B) P-3, Q-4, R-1, S-2
(C) P-4, Q-2, R-3, S-1
(D) P-2, Q-3, R-4, S-1

96. Identify the exception. Which of the following is NOT a primary function of an antivirus program?
(A) Signature-based detection of malware
(B) Hardware performance optimization and defragmentation
(C) Heuristic analysis of suspicious file behavior
(D) Quarantine of infected files

97. Arrange the following phases of a structured Incident Response plan in the correct order:
1. Containment, Eradication, and Recovery
2. Post-Incident Activity (Lessons Learned)
3. Preparation
4. Detection and Analysis
Which of the following represents the correct sequence?
(A) 3, 4, 1, 2
(B) 4, 3, 1, 2
(C) 3, 1, 4, 2
(D) 1, 4, 3, 2

98. An organization sends simulated, deceptive emails to its employees claiming they must urgently update their passwords by clicking a link. What is the organization attempting to assess?
(A) The robustness of its firewalls
(B) Employee susceptibility to phishing attacks
(C) The speed of the internal mail server
(D) The effectiveness of its data backup strategy

99. Identify the odd one out among the following cryptographic algorithms:
(A) AES (Advanced Encryption Standard)
(B) DES (Data Encryption Standard)
(C) Blowfish
(D) RSA (Rivest-Shamir-Adleman)

100. Which of the following is the most appropriate reason for an individual to practice strict "cyber hygiene"?
(A) To prevent physical wear and tear on computing devices
(B) To legally bypass geographical restrictions on content
(C) To reduce the electricity consumption of home networks
(D) To minimize risks of data compromise and cyber attacks

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(B) Identification
(C) Eradication
(D) Containment

46. A stateful inspection firewall improves network security by performing which of the following functions?
(A) It examines only the header of individual packets independently
(B) It tracks the operating state and characteristics of active network connections
(C) It automatically encrypts all traffic passing through the router
(D) It manages employee passwords for network login

47. The primary objective of an information security audit is to:
(A) Prosecute cyber criminals within a legal court of law
(B) Measure security posture against established frameworks
(C) Restore data from backups following a ransomware attack
(D) Physically secure the perimeter of a large office building

48. Within a Public Key Infrastructure (PKI), what is the primary role of a Certificate Authority (CA)?
(A) To generate private keys for users in an automated fashion
(B) To manage digital certificates binding public keys to entities
(C) To store encrypted backups of sensitive organizational data
(D) To scan internal networks for malware and system vulnerabilities

49. Consider the following statements regarding Virtual Private Networks (VPNs):
I. VPNs create a secure, encrypted connection over a less secure network.
II. Split tunneling allows a user to route some traffic through the VPN and some directly to the internet.
III. PPTP is currently considered the most secure VPN protocol available.
IV. OpenVPN is an open-source VPN protocol that utilizes SSL/TLS for key exchange.
Which of the above statement(s) is/are correct?
(A) I, II, and IV only
(B) I, III, and IV only
(C) II, III, and IV only
(D) I, II, III, and IV

50. The following question consists of two statements — Assertion (A) and Reason (R). Answer the question by selecting the appropriate option.
Assertion (A): Multi-Factor Authentication (MFA) provides a higher level of security than single-factor authentication.
Reason (R): MFA requires an attacker to compromise two or more distinct types of authentication mechanisms to gain access.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

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51. An organization decides to establish a secondary facility that is fully equipped with hardware, software, and real-time data synchronization to take over operations immediately in case of a disaster. This is known as a:
(A) Cold site
(B) Warm site
(C) Hot site
(D) Mobile site

52. What is the primary drawback of symmetric encryption compared to asymmetric encryption?
(A) Symmetric encryption is computationally much slower for processors
(B) Symmetric encryption generates significantly larger ciphertexts
(C) Symmetric encryption cannot be used for standard communications
(D) Symmetric encryption requires secure sharing of the secret key

53. During the SSL/TLS handshake process, the server and client communicate to agree upon which of the following?
(A) The physical routing path for the transmission of data packets
(B) The IP addresses to be assigned to the client host dynamically

9. (B) A dictionary attack uses a list of common words and phrases, while brute force tries all possible character combinations
Password cracking techniques vary based on their search parameters and efficiency. A dictionary attack utilizes a predefined list of likely passwords, such as common words or previous leaks, making it faster but limited. In contrast, a brute force attack systematically tries every possible combination of characters, which guarantees success eventually but requires significantly more time and high computational resources.

10. (C) Spyware monitors users, whereas adware displays advertisements
Different types of malware are categorized by their primary intent and functional behavior. Spyware is designed to secretly gather information about a user's activities, keystrokes, or personal data without consent. Adware, while sometimes invasive, focuses on automatically delivering or displaying advertising material, such as pop-ups or banners, often to generate revenue for the developer through clicks or impressions.

11. (B) II and V only
Network security devices have distinct operational roles. While firewalls can be either hardware-based or software-based, an Intrusion Detection System is designed only to monitor and alert administrators of suspicious activity. It lacks the inherent capability to block traffic. Conversely, an Intrusion Prevention System actively identifies and stops threats, whereas proxy servers facilitate resource requests on behalf of clients.

12. (C) P-3, Q-4, R-2, S-1
Malware variants possess unique characteristics for infection and operation. Viruses require a host file to execute and spread, whereas worms self-replicate independently across network connections. Trojans deceive users by appearing as legitimate software to gain system access. Ransomware focuses on financial extortion by encrypting a user's valuable data and demanding a payment for the necessary and correct decryption key.

13. (A) SQL Injection
SQL Injection is a code injection technique where malicious SQL statements are inserted into entry fields for execution. This vulnerability allows attackers to interfere with the queries that an application makes to its database. By manipulating these inputs, unauthorized actors can view sensitive data, modify database records, or even gain administrative control over the entire database management system.

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14. (C) Human psychology and trust
Social engineering involves the psychological manipulation of individuals to trick them into divulging confidential information or performing actions that compromise security. Rather than exploiting technical software flaws, these attacks target human vulnerabilities like trust, fear, or curiosity. By assuming false identities or creating urgent scenarios, attackers persuade victims to bypass standard security protocols and provide access to restricted systems.

15. (D) Iranian nuclear enrichment centrifuges
Stuxnet was a highly sophisticated computer worm discovered in 2010, specifically engineered to sabotage industrial control systems. It targeted programmable logic controllers used in uranium enrichment facilities. By subtly altering the rotational speeds of centrifuges, the malware caused physical damage to the equipment while reporting normal operations to supervisors, marking a significant milestone in the history of cyber warfare.

16. (A) Confidentiality, Integrity, Availability
The CIA triad serves as the core model for developing security policies and protecting information assets. Confidentiality ensures that sensitive data is accessible only to authorized individuals. Integrity guarantees that information remains accurate and hasn't been tampered with during storage or transit. Availability ensures that systems and data are consistently accessible to legitimate users whenever they are required for operations.

17. (A) Long-term, stealthy access to a specific target network
An Advanced Persistent Threat is a sophisticated, sustained cyberattack where an intruder establishes an undetected presence in a network to steal sensitive data over a long period. These attacks are carefully planned and targeted at specific organizations or nations. Unlike

(D) Bypassing the lock screen using a master password

64. Arrange the following phases of a standard data processing lifecycle in the correct chronological order:
1. Data Storage
2. Data Collection
3. Data Destruction/Disposal
4. Data Processing/Analysis

Which of the following represents the correct sequence?
(A) 2, 4, 1, 3
(B) 2, 1, 4, 3
(C) 1, 2, 4, 3
(D) 2, 3, 1, 4

65. According to Section 66C of the IT Act, 2000, what is the maximum imprisonment prescribed for the offense of identity theft?
(A) Up to 1 year
(B) Up to 3 years
(C) Up to 5 years
(D) Life imprisonment

66. What is the primary objective of the Tallinn Manual?
(A) Non-binding study on international law in cyber warfare
(B) Unified global currency standard for electronic commerce
(C) Mandate for open-source hardware usage in NATO countries
(D) Dictating privacy policies for social media platforms

67. Under the shared responsibility model in Cloud Computing, which of the following is strictly the responsibility of the Cloud Service Provider (CSP) in an Infrastructure as a Service (IaaS) environment?
(A) Securing the customer's specific application code
(B) Managing the customer's database user credentials
(C) Securing the hypervisor and server hardware
(D) Configuring the customer's virtual firewall rules

68. In 2022, CERT-In issued directives mandating that all service providers, intermediaries, and corporate bodies must report severe cyber incidents within what timeframe?
(A) 6 hours
(B) 12 hours
(C) 24 hours
(D) 48 hours

69. What is the primary focus of the Cyber Surakshit Bharat initiative?
(A) Training for CISOs and IT staff in government
(B) Distributing free antivirus software to citizens
(C) Building sovereign data centers for the military
(D) Developing indigenous operating system software

70. Under the Information Technology Act, 2000, which section primarily deals with the punishment for hacking or computer-related offenses resulting in damage to a computer system?
(A) Section 43
(B) Section 65
(C) Section 66
(D) Section 67

71. In a corporate environment, which executive role is primarily responsible for establishing and maintaining the enterprise vision, strategy, and program to ensure information assets and technologies are adequately protected?
(A) Chief Information Security Officer
(B) Chief Executive Officer
(C) Chief Financial Officer
(D) Chief Operating Officer

72. Which of the following sequences represents the correct order of the five core functions of the NIST Cybersecurity Framework?
(A) Detect → Protect → Identify → Respond → Recover
(B) Identify → Protect → Detect → Respond → Recover
(C) Protect → Detect → Respond → Identify → Recover
(D) Respond → Identify → Detect → Protect → Recover

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When these individuals intentionally misuse their access to leak confidential information, steal intellectual property, or damage systems, it poses a significant security risk because they often bypass external defenses and security perimeters.

27. (A) Cyber espionage and disruption of critical infrastructure
State-sponsored cyber attacks are conducted by or on behalf of a sovereign nation to advance its geopolitical interests. These operations typically prioritize long-term intelligence gathering through cyber espionage or the strategic disruption of an adversary's critical infrastructure. Unlike traditional cybercriminals motivated by immediate financial gain, state actors focus on gaining a strategic advantage, influencing political outcomes, or compromising national security.

28. (B) II and III only
Phishing attacks are categorized by their delivery method and target profile. Whaling specifically targets high-level executives to gain access to sensitive corporate secrets. Smishing utilizes mobile text messages to deceive individuals into sharing private data. Conversely, spear phishing is a highly targeted attack directed at specific individuals or organizations, rather than a generic message sent to a massive, undifferentiated audience.

29. (C) Time between flaw discovery and application of a patch
The window of vulnerability refers to the critical period during which a software system is exposed to potential exploitation. This timeframe begins when a security flaw is first discovered by an attacker and ends only when a protective patch is successfully applied by the user. During this interval, the system remains defenseless against specific threats targeting that unpatched software vulnerability.

30. (D) DoS uses one source, whereas DDoS uses multiple compromised sources
Denial of Service and Distributed Denial of Service attacks both aim to disrupt the availability of a network resource. The primary distinction lies in the scale and source of the attack. A standard DoS attack originates from a single internet connection, whereas a DDoS attack leverages a large network of distributed, compromised devices to flood the target with overwhelming traffic volume.

31. (C) Person B's public key
In asymmetric encryption, also known as public-key cryptography, each user has a pair of mathematically related keys. To ensure a message is secure and can only be read by the intended recipient, the sender must encrypt the data using the recipient's public key. Once encrypted, only the recipient's corresponding private key, which is kept secret, can successfully decrypt and reveal the message.

32. (B) IPsec
Internet Protocol Security is a suite of protocols used to secure network communications by authenticating and encrypting each IP packet in a data stream. It is a fundamental component of many Virtual Private Networks, providing a secure tunnel for data transmission over public networks. IPsec ensures the confidentiality and integrity of information as it travels between devices or sites across the internet.

33. (B) Ciphertext
Encryption is the process of converting readable information, known as plaintext, into an encoded format to prevent unauthorized access. The resulting unreadable data is called ciphertext. To return the information to its original, understandable state, a specific decryption key or algorithm must be applied. This transformation is essential for protecting sensitive data during transmission and storage from interception by malicious actors.

34. (D) P-3, Q-2, R-4, S-1
Digital forensics relies on maintaining evidence integrity through specific procedures. The chain of custody documents the chronological handling of evidence, while write blockers prevent any modification during data acquisition. Hashing verifies that a disk image remains an exact copy of the original source. Volatile data refers to information held in temporary memory, which is lost immediately if the system loses power.

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35. (A) Port 443
Network protocols use specific port numbers to direct traffic to the correct service on a server. While standard web traffic over HTTP typically uses port 80, the secure version, HTTPS, defaults to port 443. This port facilitates encrypted communication using SSL/TLS, ensuring that data exchanged between a web browser and a server remains confidential and protected from eavesdropping or tampering.

36. (A) Maximum acceptable data loss measured in time
The Recovery Point Objective is a critical metric in disaster recovery planning that defines the maximum age of files that must be recovered from backup storage for normal operations to resume. It essentially determines the frequency of backups required. For example, an RPO of four hours means that the organization can tolerate losing no more than four hours of generated data.

37. (A) IDS alerts administrators, while IPS automatically blocks threats
Both systems monitor network traffic for malicious activity, but they differ in their response capabilities. An Intrusion Detection System acts as a passive observer, analyzing traffic and generating alerts when potential threats are identified. In contrast, an Intrusion Prevention System is an active defense mechanism that not only detects suspicious patterns but also takes immediate action to block or drop the malicious traffic.

38. (D) A smart card
Multi-factor authentication utilizes different categories of credentials to verify a user's identity. The "something you have" factor refers to physical objects in the user's possession, such as a smart card, hardware token, or a mobile phone. This contrasts with "something you know," like a password, and "something you are," which involves biometric characteristics like fingerprints or retina patterns of the individual.

39. (D) Reconnaissance / Footprinting
The initial phase of ethical hacking involves reconnaissance, where the tester gathers as much information as possible about the target organization's network and systems. This process, also known as footprinting, includes identifying IP addresses, domain names, and employee details through public records and social engineering. This foundational step is crucial for discovering potential entry points and vulnerabilities to be exploited later.

40. (D) Border Gateway Protocol (BGP)
A Public Key Infrastructure consists of various components that manage digital certificates and public-key encryption. Key elements include the Certificate Authority for issuing certificates, the Registration Authority for verifying identities, and Certificate Revocation Lists for managing invalidated credentials. Border Gateway Protocol, however, is a routing protocol used to exchange reachability information between autonomous systems on the internet and is unrelated to PKI.

41. (A) II, III, and V only
The shared responsibility model defines security obligations between cloud providers and customers. In Software as a Service, the provider manages the application and infrastructure. Across all models, customers typically retain responsibility for data security and identity management. However, in Infrastructure as a Service, the provider, not the customer, handles physical data center security, while the customer manages the operating system.

42. (C) Plaintext → Secret Key Encryption → Ciphertext → Same Secret Key Decryption → Plaintext
Symmetric encryption is a cryptographic method where the same secret key is used for both encrypting the original message and decrypting the resulting ciphertext. The process begins with readable plaintext, which is transformed into an unreadable format using the key. To retrieve the original information, the recipient must apply the exact same key, ensuring efficient and fast data protection for large volumes.

43. (B) Retina scan
A retina scan is a biometric technology that maps the unique patterns of blood vessels on the thin tissue at the back of an individual's eye. Because these patterns are highly stable and nearly impossible to forge, they provide a very high level of security. This differs from iris recognition, which focuses on the colored ring surrounding the pupil of the eye.

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44. (D) Non-repudiation
Non-repudiation is a security principle that ensures a party in a communication cannot deny having sent a message or performed an action. Digital signatures achieve this by using the sender's unique private key to create a mathematical proof. Because only the sender possesses this key, the signature serves as undeniable evidence of their participation, providing legal and technical certainty in electronic transactions.

45. (C) Eradication
Incident response consists of several structured phases to manage a security breach. Following containment, where the spread of the threat is stopped, the eradication phase focuses on identifying and removing the root cause of the incident. This involves deleting malware, closing compromised user accounts, and patching vulnerabilities to ensure the threat is completely eliminated from the environment before systems are restored.

46. (B) It tracks the operating state and characteristics of active network connections
Stateful inspection firewalls provide enhanced security by monitoring the entire context of network traffic. Unlike simple packet filtering that examines data in isolation, stateful inspection keeps track of the state of active connections and ensures that incoming packets are part of an established, legitimate session. This allows the firewall to distinguish between authorized traffic and unauthorized attempts to penetrate the network.

47. (B) Measure security posture against established frameworks
An information security audit is a systematic evaluation of an organization's security policies, procedures, and technical controls. Its main goal is to determine how well these measures align with established standards or regulatory requirements. By identifying gaps and weaknesses, the audit provides a clear assessment of the overall security posture, allowing the organization to mitigate risks and improve its defensive capabilities.

48. (B) To manage digital certificates binding public keys to entities
A Certificate Authority is a trusted third-party entity responsible for issuing and managing digital certificates within a Public Key Infrastructure. These certificates serve to verify the identity of individuals, organizations, or devices by binding their public keys to their identities. By vouching for the authenticity of the certificate holder, the CA enables secure, encrypted communication and trust in various digital environments.

49. (A) I, II, and IV only
Virtual Private Networks provide secure tunnels for data over public networks using various protocols. Split tunneling is a feature that optimizes bandwidth by routing only specific traffic through the encrypted connection. While OpenVPN is a modern, secure standard, older protocols like PPTP are now considered insecure due to known vulnerabilities. Thus, selecting robust, up-to-date protocols is essential for maintaining a secure VPN infrastructure.

50. (A) Both A and R are true and R is the correct explanation of A.
Multi-Factor Authentication significantly strengthens security by requiring users to provide two or more different types of evidence before gaining access to a system. This approach forces an attacker to simultaneously compromise multiple independent factors, such as a password and a physical token or biometric scan. This layered defense dramatically reduces the likelihood of unauthorized access compared to relying on a single password.

51. (C) Hot site
A hot site is a fully functional backup data center that remains continuously operational with up-to-date hardware, software, and mirrored data. In the event of a disaster at the primary location, the hot site can take over all business processes almost instantly. This provides the highest level of protection against downtime, although it is also the most expensive disaster recovery option.

52. (D) Symmetric encryption requires secure sharing of the secret key
The primary challenge of symmetric encryption is the secure distribution of the single secret key shared between the sender and receiver. If this key is intercepted during transmission, the security of the entire communication is compromised. In contrast, asymmetric encryption solves this problem by using public keys for encryption,

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regarding their personal data. These include the right to access information about how their data is used, the right to correct or erase inaccurate data, and the right to seek grievance redressal. However, the Act does not provide a right for individuals to demand profits made from data.

88. (B) Shreya Singhal vs Union of India
In the landmark 2015 case of Shreya Singhal vs. Union of India, the Supreme Court struck down Section 66A of the IT Act. The court ruled that the section was unconstitutionally vague and violated the fundamental right to freedom of speech and expression. This decision was a major victory for digital rights in India, preventing the misuse of law to suppress online dissent.

89. (B) Private industry partners
The Cyber Surakshit Bharat initiative is a collaborative effort between the Ministry of Electronics and IT and various private sector industry partners. This public-private partnership aims to leverage the expertise and resources of the technology industry to strengthen India's cybersecurity defenses. By working together, the government and private companies can more effectively address emerging threats and build a resilient ecosystem.

90. (A) Ministry of Electronics and IT
The Indian Computer Emergency Response Team, known as CERT-In, is the national nodal agency responsible for responding to computer security incidents. It operates under the Ministry of Electronics and Information Technology. CERT-In's functions include analyzing information on cyber threats, issuing alerts and advisories, and coordinating emergency response efforts to protect the nation's digital infrastructure from various cyberattacks and system vulnerabilities.

91. (B) Base64 encoding provides high security against attackers
Cryptographic security relies on strong algorithms and practices. Hash functions are designed to be irreversible, and adding a random salt to passwords prevents precomputed attacks. Elliptic Curve Cryptography offers high security with shorter keys, enhancing efficiency. Conversely, Base64 encoding is not a security measure but a method for converting binary data into a text format, making it easily reversible.

92. (C) Severe financial penalties and loss of customer trust
A massive data breach can have devastating consequences for an e-commerce platform. Beyond the immediate technical challenges of securing the network, the company often faces significant legal and financial penalties from regulatory bodies. Perhaps more critically, the loss of customer trust can lead to a long-term decline in sales and brand reputation, as users become hesitant to share sensitive information.

93. (D) SOC Analyst
A Security Operations Center analyst is responsible for the continuous monitoring and analysis of an organization's security posture. They use various tools to examine log files, network traffic, and system activity in real-time to identify any unusual or malicious behavior. By detecting and investigating potential threats as they emerge, SOC analysts play a critical role in the early detection and mitigation.

94. (C) Statement I is correct but Statement II is incorrect
Digital signatures are built on asymmetric cryptography to provide authentication, integrity, and non-repudiation. They ensure that a message was sent by a specific sender and has not been altered. However, a digital signature alone does not provide confidentiality; the message content remains readable unless it is separately encrypted. Thus, while signatures verify the source of data, they do not hide it.

95. (A) P-4, Q-3, R-2, S-1
Cyberattacks can be mapped to different layers of the OSI model based on their target. MAC spoofing occurs at the Data Link Layer, while IP spoofing targets the Network Layer. Port scanning is a technique used at the Transport Layer to identify open services. HTTP flood attacks, which are a form of DDoS, specifically target the Application Layer to overwhelm server resources.

96. (B) Hardware performance optimization and defragmentation
Antivirus programs are primarily designed to detect, neutralize, and remove malicious software from a computer system. Their core functions include scanning files for known malware

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results against the original plan and finally act to correct any deficiencies or refine the system based on the evaluation findings.

62. (C) Section 70A
The National Critical Information Infrastructure Protection Centre was established under Section 70A of the Information Technology Act, 2000. As the nodal agency, its primary role is to protect the nation's critical information infrastructure from cyber threats. This includes overseeing the security of essential sectors like power, banking, and transportation, whose disruption could significantly impact national security, economy, or public health.

63. (A) Installing an application from an unofficial source
Sideloading refers to the practice of installing mobile applications from sources other than official app stores, such as a direct download from a website or via a USB connection. While this allows users to access a wider range of software, it also significantly increases the risk of installing malicious or unvetted applications that could compromise the device's security and data privacy.

64. (B) 2, 1, 4, 3
The data processing lifecycle represents the sequence of stages through which data passes from its initial creation to its final removal. It begins with data collection from various sources, followed by its storage in secure databases. The data is then processed and analyzed to extract meaningful insights. Finally, when the information is no longer needed, it undergoes secure destruction or disposal.

65. (B) Up to 3 years
Section 66C of the Information Technology Act, 2000 addresses the offense of identity theft, which involves the fraudulent use of another person's electronic signature, password, or unique identification feature. Individuals convicted of this crime can face imprisonment for a term that may extend up to three years, along with a potential fine, reflecting the seriousness of compromising personal digital identities.

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66. (A) Non-binding study on international law in cyber warfare
The Tallinn Manual is an influential, non-binding scholarly study conducted by an international group of experts. It explores how existing international law, including the law of armed conflict and human rights law, applies to cyber warfare and cyber operations. While not a formal treaty, it provides critical guidance for nations on the legal boundaries of state behavior in the digital domain.

67. (C) Securing the hypervisor and server hardware
In the Infrastructure as a Service model, the cloud service provider is responsible for the security of the underlying physical infrastructure. This includes the data centers, servers, storage, and the hypervisor layer that enables virtualization. In contrast, the customer is responsible for securing their own virtual machines, operating systems, applications, and the data they choose to store and process.

68. (A) 6 hours
In 2022, the Indian Computer Emergency Response Team issued new directives aimed at enhancing cybersecurity situational awareness. These mandates require all service providers, intermediaries, and corporate bodies to report significant cyber incidents within a strict timeframe of six hours of noticing them. This rapid reporting is intended to facilitate timely intervention and information sharing to prevent widespread damage across the digital infrastructure.

69. (A) Training for CISOs and IT staff in government
The Cyber Surakshit Bharat initiative was launched to strengthen the cybersecurity ecosystem in India by focusing on capacity building. Its primary objective is to train Chief Information Security Officers and frontline IT staff across various government departments. By providing specialized knowledge and tools, the program aims to ensure that government entities are better equipped to detect, prevent, and respond to cyber threats.

70. (C) Section 66
Section 66 of the Information Technology Act, 2000, as amended, provides the legal framework for punishing computer-related offenses. It

CHAPTER 22

E-Governance and Digital Public Services

1. Select the correct answer for the following Assertion (A) and Reason (R) using the options provided below.
Assertion (A): The Direct Benefit Transfer (DBT) system significantly reduces leakages and delays in the distribution of welfare funds.
Reason (R): DBT routes financial benefits directly into the Aadhaar-seeded bank accounts of the beneficiaries, bypassing physical intermediaries.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

2. In the context of e-governance, what does the acronym SMART stand for?
(A) Social, Moral, Accountable, Responsive, Transparent
(B) Simple, Manageable, Accessible, Reliable, Timely
(C) Simple, Moral, Accountable, Responsive, Transparent
(D) Secure, Moral, Accessible, Responsive, Transparent

3. Consider the following statements regarding Aadhaar and its legal framework:
I. It is a 12-digit random number issued by the Unique Identification Authority of India (UIDAI).
II. Aadhaar serves as absolute proof of citizenship under the Citizenship Act.
III. It utilizes both demographic and biometric data for authentication.
IV. Aadhaar Act was passed in 2016 to provide a statutory framework.
Which of the above statement(s) is/are correct?
(A) I, II and IV
(B) II, III and IV
(C) I, III and IV
(D) I, II and III

4. The Digital India programme is structured around how many core pillars?
(A) 5
(B) 7
(C) 9
(D) 11

5. Match the following digital payment systems in List I with their descriptions in List II:
List I: Digital payment systems
P. UPI
Q. BHIM
R. RuPay
S. AEPS
List II: Descriptions
1. Biometric authenticated payment system using Aadhaar
2. Domestic card payment network developed by NPCI
3. Real-time inter-bank payment mechanism
4. Mobile application facilitating digital payments based on UPI
(A) P-4, Q-3, R-1, S-2
(B) P-3, Q-4, R-2, S-1
(C) P-3, Q-2, R-4, S-1
(D) P-1, Q-4, R-2, S-3

6. Which of the following best describes the storage capacity initially allocated to a standard user account on the DigiLocker platform?
(A) 100 MB
(B) 1 GB
(C) 10 GB
(D) Unlimited

7. Consider the following statements regarding the models of e-governance:
I. Government-to-Citizen (G2C) involves providing online public utility services like bill payments.
II. Government-to-Business (G2B) includes e-procurement and corporate tax filing

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related crimes and protecting the interests of participants in the digital economy.

79. (B) Infrastructure whose damage impacts national security
Critical Information Infrastructure is defined as any computer resource whose destruction or incapacitation would have a debilitating impact on national security, the economy, public health, or safety. These systems form the backbone of essential services like telecommunications, power, and banking. Protecting CII is a top priority because a successful attack on these assets could cause widespread disruption and threaten national stability.

80. (D) P-3, Q-2, R-4, S-1
India's cybersecurity landscape is managed by several specialized agencies. CERT-In serves as the national nodal agency for incident response, while NCIIPC focuses on protecting critical information infrastructure. The I4C initiative, under the Ministry of Home Affairs, facilitates collaboration to combat cybercrime. Finally, NTRO acts as a technical intelligence-gathering agency, providing essential data for national security and strategic interests.

81. (C) India has not signed the treaty due to sovereignty concerns
India has consistently maintained its stance of not signing the Budapest Convention on Cybercrime. The government's primary concerns involve national sovereignty and the belief that the treaty's provisions could allow foreign law enforcement agencies to access Indian data without adequate safeguards. Instead, India has advocated for an inclusive, UN-led international framework for cybercrime cooperation that better reflects developing nations' interests.

82. (A) An Information Security Management System (ISMS)
The ISO/IEC 27001 standard specifies the requirements for establishing, implementing, maintaining, and continually improving an Information Security Management System. It provides a systematic approach for managing sensitive company information, ensuring its confidentiality, integrity, and availability. By adhering to this internationally recognized standard, organizations can demonstrate their commitment to robust security practices and the effective management of digital risk.

83. (D) Section 69
Section 69 of the Information Technology Act, 2000, as amended in 2008, empowers the government to intercept, monitor, or decrypt any information transmitted through a computer resource. These powers can be exercised in the interest of national sovereignty, defense, or public order. This section provides the legal basis for lawful surveillance and investigations, balanced by procedural safeguards to prevent misuse.

84. (C) Data Fiduciary
In the Digital Personal Data Protection Act, 2023, the Data Fiduciary is the entity that determines the purpose and means of processing personal data. This can be an individual, a company, or a government body. The Data Fiduciary bears the primary responsibility for ensuring compliance with the Act, including obtaining consent from Data Principals and protecting the security of the data.

85. (B) 5 Lakhs
One of the strategic objectives of the National Cyber Security Policy of 2013 was to build a robust workforce of cybersecurity professionals in India. The policy aimed to create a pool of 500,000 (five lakh) trained experts over a five-year period. This initiative was intended to address the growing demand for skilled personnel to protect the nation's digital infrastructure and combat threats.

86. (B) Enforce policies and manage compromised devices
Mobile Device Management solutions are tools used by organizations to secure and manage mobile devices used by their employees. MDM allows IT administrators to enforce security policies, such as requiring passwords or encrypting data, and to remotely wipe or lock devices if they are lost or stolen. This centralized control is essential for protecting corporate data and ensuring compliance with standards.

87. (B) Right to demand a share of profits generated from their data
The Digital Personal Data Protection Act, 2023, grants individuals several fundamental rights

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which can be openly shared, while keeping the corresponding decryption key private.

53. (C) The cryptographic algorithms and session keys used for security
During an SSL/TLS handshake, the client and server exchange information to establish a secure connection. They negotiate which encryption algorithms and hashing methods to use, verify the server's identity through digital certificates, and generate unique session keys for the current communication. This process ensures that all data subsequently transmitted between the two parties is encrypted and protected from interception or tampering.

54. (C) Assessment identifies weaknesses; pen testing simulates attacks
Vulnerability assessments and penetration tests serve different purposes in security evaluations. An assessment is a broad, automated scan that identifies and catalogs known security flaws within a system. Conversely, a penetration test is a more focused, manual simulation of a real-world cyberattack. It attempts to actively exploit discovered vulnerabilities to determine the actual depth of access an intruder could achieve.

55. (A) Probability of incorrectly identifying an unauthorized user
The False Acceptance Rate is a key performance metric in biometric security systems. It represents the likelihood that the system will incorrectly grant access to an unauthorized individual by wrongly matching their biometric data with a registered template. A lower FAR indicates a more secure system, as it minimizes the chances of impostors successfully bypassing security measures through faulty recognition.

56. (A) Cryptographic algorithms
Cryptographic algorithms are complex mathematical formulas used to encrypt and decrypt data, ensuring its confidentiality and integrity. These algorithms transform readable information into an unreadable format using specific keys and logical operations. In modern digital security, they form the foundation of secure communication protocols, digital signatures, and data storage protections by making it computationally difficult for unauthorized parties to decipher information.

57. (A) It ensures the evidence remains legally admissible in court
In digital forensics, the chain of custody provides a chronological record of how evidence was handled, from its collection to its presentation in a legal proceeding. This documentation proves that the evidence remained secure and was not tampered with or contaminated by unauthorized individuals. Maintaining this record is essential for establishing the integrity and reliability of digital evidence in a court.

58. (C) I and III only
Transport Layer Security is the updated and more secure successor to the Secure Sockets Layer protocol. These protocols operate at the transport layer of the network, not the physical layer, to provide encrypted communication over the internet. HTTPS specifically utilizes these protocols to secure data exchanged between web browsers and servers, ensuring user information remains private and protected from potential eavesdropping.

59. (C) White Box Testing
White box testing is an ethical hacking approach where the tester has full access to the target's internal details, including network diagrams, source code, and IP addresses. This transparency allows for a comprehensive evaluation of the system's security from an insider's perspective. It contrasts with black box testing, where the tester has no prior knowledge, and gray box testing, which involves partial knowledge.

60. (B) The sender's private key
To generate a digital signature, the sender first calculates a unique hash of the message and then encrypts that hash using their own private key. Because this private key is known only to the sender, the resulting signature provides proof of authenticity and integrity. The recipient can then use the sender's corresponding public key to decrypt and verify the original hash value.

61. (C) Plan, Do, Check, Act
The Plan-Do-Check-Act cycle is a four-step iterative management method used in the ISO 27001 standard for the continuous improvement of an Information Security Management System. Organizations first plan their security objectives, then implement them. They then check the

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signatures, performing heuristic analysis to identify suspicious behavior, and quarantining infected files to prevent further spread. While some security suites may include performance tools as extras, hardware optimization and disk defragmentation are not fundamental features.

97. (A) 3, 4, 1, 2
A structured incident response plan follows a logical progression of phases to effectively manage a security event. The process begins with preparation, where teams are trained and tools are implemented. This is followed by detection and analysis to identify a breach. Once an incident is confirmed, the team moves to containment, eradication, and recovery, concluding with post-incident activity and documentation.

98. (B) Employee susceptibility to phishing attacks
Organizations often conduct simulated phishing exercises to test their employees' awareness and ability to recognize deceptive emails. By sending realistic but harmless fake messages that prompt users to click suspicious links or provide credentials, the organization can identify which staff members need additional security training. This proactive approach helps reduce the risk of successful real-world social engineering attacks and improves security.

99. (D) RSA (Rivest-Shamir-Adleman)
Cryptographic algorithms are broadly classified as either symmetric or asymmetric. AES, DES, and Blowfish are all symmetric algorithms, meaning they use the same secret key for both encryption and decryption. In contrast, RSA is an asymmetric algorithm that uses a pair of mathematically linked keys, a public key and a private key. This fundamental difference in key management sets it apart.

100. (D) To minimize risks of data compromise and cyber attacks
Cyber hygiene refers to the regular practices and steps individuals and organizations take to maintain the health and security of their online accounts and devices. Just as personal hygiene prevents illness, good cyber hygiene, such as using strong passwords and keeping software updated, significantly reduces the likelihood of successful data breaches and cyberattacks. Consistently following these routines is essential for protection.

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specifically addresses fraudulent or dishonest acts involving computer resources that cause damage or disruption. Individuals found guilty of hacking or similar offenses under this section can face imprisonment for up to three years or a fine, or both, ensuring accountability for digital crimes.

71. (A) Chief Information Security Officer
The Chief Information Security Officer is the senior executive responsible for establishing and maintaining an organization's overall information security strategy. This role involves managing security programs, identifying and mitigating risks, and ensuring that information assets are adequately protected. The CISO aligns security initiatives with business goals and oversees the implementation of policies and technologies to safeguard the organization from evolving cyber threats.

72. (B) Identify → Protect → Detect → Respond → Recover
The NIST Cybersecurity Framework provides a structured approach for managing cybersecurity risks. It consists of five core functions that should be performed in a specific sequence. Organizations first identify their assets and risks, then implement protective measures. Next, they must detect potential security events, respond appropriately to any incidents that occur, and finally, recover any lost data or services.

73. (D) Creating a secure cyber ecosystem in the country
The National Cyber Security Policy of 2013 was designed to protect the information and infrastructure in cyberspace for citizens, businesses, and the government. Its primary goal is to build a secure and resilient cyber ecosystem by enhancing institutional capabilities and fostering public-private partnerships. The policy emphasizes the need for a coordinated approach to address cyber threats and ensure national digital security.

74. (C) Section 66E
Section 66E of the Information Technology Act, 2000, specifically addresses the violation of privacy by penalizing the act of intentionally capturing, publishing, or transmitting images of a person's private parts without their consent. This offense, often associated with voyeurism, is punishable by imprisonment for up to three years or a fine, reflecting the legal commitment to protecting individual digital dignity.

75. (D) Cybercrime
The Budapest Convention is the first international treaty seeking to address Internet and computer crime by harmonizing national laws, improving investigative techniques, and increasing cooperation among nations. It focuses on crimes such as copyright infringement, computer-related fraud, and child pornography. By establishing a common legal framework, the treaty enables more effective cross-border prosecution of cybercriminals and enhances global digital security.

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76. (D) Potential for cross-tenant leakage if isolation fails
Multitenancy is a core feature of public cloud computing where multiple customers share the same physical infrastructure. While cost-effective, it introduces the security risk of cross-tenant data leakage. If the logical isolation between users fails due to a vulnerability in the hypervisor or cloud management software, one customer could potentially gain unauthorized access to another customer's sensitive data or resources.

77. (D) The individual to whom the personal data relates
Under the Digital Personal Data Protection Act, 2023, the term Data Principal specifically refers to the natural person whose personal data is being collected and processed. This individual is the primary subject of the data and is granted various rights, such as the right to access, correct, or erase their information. Protecting the interests and privacy of the Data Principal is central.

78. (D) To provide legal recognition for electronic transactions and crime
The Information Technology Act, 2000, was enacted to provide a legal framework for electronic governance and commerce in India. It gives legal recognition to electronic records and digital signatures, enabling secure online transactions. Additionally, the Act defines various cyber offenses and prescribes punishments, creating a legal basis for prosecuting computer-

systems.
III. Government-to-Employee (G2E) is strictly focused on bilateral international diplomacy.
Which of the above statement(s) is/are correct?
(A) II and III only
(B) I and II only
(C) I and III only
(D) I, II and III

8. Consider the following key Indian digital initiatives:
I. Aadhaar (UIDAI established)
II. Digital India Programme
III. MyGov platform
IV. National e-Governance Plan (NeGP)
Which of the following represents the correct chronological order of their inception/launch?
(A) IV, I, III, II
(B) I, IV, II, III
(C) IV, III, I, II
(D) I, III, IV, II

9. What does the 'e' in e-Kranti, a key pillar of the Digital India programme, stand for?
(A) Empowered digital citizens
(B) Electronic delivery of services
(C) Economic transformation
(D) Early execution of projects

10. Match the following e-governance models in List I with their suitable examples in List II:
List I: e-governance models
P. G2C (Government to Citizen)
Q. G2B (Government to Business)
R. G2G (Government to Government)
S. G2E (Government to Employee)
List II: Examples
1. Centralized Public Grievance Redress and Monitoring System
2. Human Resource Management System (HRMS)
3. Government e-Marketplace (GeM) registration
4. State Wide Area Networks connecting secretariats
(A) P-3, Q-1, R-2, S-4
(B) P-1, Q-4, R-3, S-2
(C) P-1, Q-3, R-4, S-2
(D) P-4, Q-2, R-1, S-3

11. Which of the following services cannot be accessed through the UMANG application?
(A) EPF passbook view
(B) Booking a train ticket through IRCTC
(C) Checking CBSE exam results
(D) Physical passport printing at home

12. Consider the following statements about e-governance initiatives in Madhya Pradesh:
I. The CM Helpline number for citizen grievance redressal is 181.
II. Samagra ID provides a unique identification number to families and citizens in the state.
III. MP e-Uparjan is an online platform for the public distribution system and agriculture procurement.
IV. RCMS (Revenue Case Management System) digitizes the entire revenue court proceedings.
V. Gyandoot was an early rural e-governance project launched in the Dhar district.
Which of the above statement(s) is/are correct?
(A) I, II, III and V
(B) II, III, IV and V
(C) I, II, IV and V
(D) I, II, III, IV and V

13. Which of the following describes the fundamental concept of e-governance?
(A) The use of ICT to transform government's relations with citizens, businesses, and other agencies.
(B) The digital privatization of public sector undertakings to reduce state involvement in industry.
(C) The sole use of computers for internal data typing and storage within government offices.
(D) The complete elimination of physical government offices in favor of virtual environments.

14. Match the following e-governance pillars/components in List I with their defining features in List II:
List I: e-governance pillars/components
P. Public Financial Management System (PFMS)
Q. Open Government Data (OGD)
R. e-District
S. e-Courts

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(C) MCA21 portal
(D) GSTN return filing portal

72. In the context of e-governance architectures, API Setu is:
(A) A physical structural bridge connecting two geographically separate State Data Centres
(B) An open API platform facilitating interoperability between different digital systems
(C) A comprehensive cyber security framework designed to stop malware and unauthorized access
(D) A dedicated satellite for e-governance data transmission

73. During the COVID-19 pandemic, which application was notably utilized by the Madhya Pradesh government to monitor quarantine compliance and track health data?
(A) MP Arogya
(B) Raksha Portal
(C) Swasthya MP
(D) Sarthak App

74. Which number acts as a unique identity code for families in Madhya Pradesh under the state's flagship social security integration portal?
(A) Bhamashah ID
(B) Parivar Pehchan Patra
(C) Samagra ID
(D) MP-Citizen ID

75. The statutory framework that grants legal recognition to electronic documents and digital signatures in India is the:
(A) Right to Information Act, 2005
(B) Telecommunications Act, 2023
(C) Aadhaar Act, 2016
(D) Information Technology Act, 2000

76. Which of the following is an exception to the services provided by the BHIM application?
(A) Scanning dynamic and static QR codes to facilitate instant payments
(B) Sending money securely via bank IFSC and individual Account Numbers
(C) Generating a unique UPI PIN
(D) Providing core banking overdraft facilities through the application

77. Which of the following applications is the most suitable use case for Blockchain technology in state governance?
(A) Providing secure video conferencing facilities between various ministers
(B) Broadcasting daily weather updates
(C) Generating temporary OTPs for secure access to various login portals
(D) Maintaining land registry records to prevent fraud and forgery

78. The e-Seva project, which revolutionized the payment of utility bills and delivery of citizen services, was a flagship initiative of which state?
(A) Gujarat
(B) Maharashtra
(C) Madhya Pradesh
(D) Andhra Pradesh

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79. The Revenue Case Management System (RCMS) in Madhya Pradesh is aimed at digitizing:
(A) Filing and processing of commercial and corporate tax returns
(B) Revenue court proceedings like mutation and demarcation
(C) Collection and management of RTO traffic violation challans
(D) State GST refunds

80. The 'MP e-Uparjan' portal is fundamentally designed to facilitate:
(A) Online booking and reservation of state-run tourism and hospitality facilities
(B) Digitization of historical manuscripts
(C) The mandatory online registration of all new MSME industries within the state
(D) Transparent food grain procurement from farmers at the Minimum Support Price

81. One of the most significant socio-economic challenges hindering the widespread adoption of e-governance in rural India is:
(A) The overabundance of digital devices
(B) Complete lack of electricity in urban areas
(C) High digital illiteracy and the digital divide
(D) The high speed of internet causing data overload

82. Identify the incorrect statement regarding the Right to Information (RTI) online portal:
(A) It covers public authorities under the central

II. It comprises 31 Mission Mode Projects (MMPs) at the central, state, and integrated levels.
III. Common Service Centres (CSCs) act as the front-end delivery points.
IV. State Wide Area Networks (SWAN) form the core connectivity infrastructure.
V. The vision of NeGP restricts digital services only to urban municipal areas.

Which of the above statement(s) is/are incorrect?
(A) I and V only
(B) V only
(C) II, III and V
(D) IV and V only

23. Match the following state-specific e-governance success stories in List I with the respective state in List II:

List I: e-governance success stories
P. Bhoomi
Q. e-Seva
R. FRIENDS
S. Gyandoot

List II: Respective state
1. Andhra Pradesh
2. Kerala
3. Karnataka
4. Madhya Pradesh

(A) P-1, Q-3, R-4, S-2
(B) P-3, Q-2, R-1, S-4
(C) P-4, Q-1, R-2, S-3
(D) P-3, Q-1, R-2, S-4

24. The National e-Governance Plan (NeGP) is primarily built upon three core infrastructure components. Which of the following is NOT one of them?
(A) Nationwide Common Service Centres (CSCs)
(B) State Wide Area Networks (SWAN)
(C) Centralized State Data Centres (SDC)
(D) Private corporate Virtual Private Networks

25. Consider the following fundamental layers of a typical enterprise e-governance architecture:
I. Application/Service Layer
II. Access/Presentation Layer
III. Infrastructure/Network Layer
IV. Data/Information Layer

Which of the following represents the correct sequence from the bottom (foundational layer) to the top (user interface layer)?
(A) III, IV, I, II
(B) IV, III, II, I
(C) III, I, IV, II
(D) I, IV, III, II

26. Consider the following statements regarding the UMANG platform:
I. It stands for Unified Mobile Application for New-age Governance.
II. It was developed by the Ministry of Electronics and Information Technology (MeitY).
III. It provides integrated access to central and state government services.
IV. The platform is accessible solely via smartphones and not feature phones.

Which of the above statement(s) is/are incorrect?
(A) I and II only
(B) III and IV only
(C) II and III only
(D) IV only

27. In the structure of Common Service Centres (CSCs), who are the VLEs?
(A) Village Level Entrepreneurs
(B) Village Level Executives
(C) Virtual Local Enterprises
(D) Verified Legal Entities

28. Match the following digital platforms in List I with their primary purpose in List II:

List I: Digital platforms
P. SWAYAM
Q. PRAGATI
R. e-Sanjeevani
S. DIKSHA

List II: Primary purpose
1. National Telemedicine Service
2. Digital Infrastructure for Knowledge Sharing
3. Massive Open Online Courses
4. Pro-Active Governance and Timely Implementation

(A) P-3, Q-4, R-1, S-2
(B) P-2, Q-4, R-1, S-3
(C) P-3, Q-1, R-4, S-2
(D) P-4, Q-3, R-2, S-1

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List II: Defining features
1. Platform under NDSAP for proactive data release
2. Digitization of state-level citizen-centric services
3. Tracking of funds released under government schemes
4. Computerization of judicial processes and case records

(A) P-1, Q-3, R-4, S-2
(B) P-3, Q-2, R-1, S-4
(C) P-3, Q-1, R-2, S-4
(D) P-2, Q-4, R-3, S-1

15. The CSC e-Governance Services India Limited, which acts as the implementation agency for the CSC scheme, was set up under which legal structure?
(A) A statutory body under an Act of Parliament
(B) A cooperative society under the Multi-State Cooperative Societies Act
(C) A public trust under the Indian Trusts Act
(D) A Special Purpose Vehicle (SPV) under the Companies Act

16. Consider the following statements regarding the pillars of the Digital India programme:
I. Broadband Highways aims to provide high-speed internet across all gram panchayats.
II. e-Kranti focuses exclusively on electronic delivery of private corporate services.
III. Universal Access to Mobile Connectivity aims to cover unconnected villages.
Which of the above statement(s) is/are incorrect?
(A) II only
(B) I and III only
(C) I and II only
(D) III only

17. Which central ministry is the nodal agency for implementing the Digital India programme?
(A) Ministry of Electronics and Information Technology
(B) Ministry of Information, Communication and Broadcasting
(C) Ministry of Science, Technology and Innovation
(D) Ministry of Home Affairs and Internal Security

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18. Select the correct answer for the following Assertion (A) and Reason (R) using the options provided below.
Assertion (A): Documents digitally signed and directly pushed by registered issuers into a user's DigiLocker are treated at par with original physical documents.
Reason (R): The Information Technology (Preservation and Retention of Information by Intermediaries Providing Digital Locker Facilities) Rules, 2016 provide legal equivalence to such electronic records.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

19. Which of the following models of e-governance involves electronic interactions between two or more government departments or agencies?
(A) G2C
(B) G2B
(C) G2E
(D) G2G

20. Arrange the following stages in the evolution of e-governance in the correct sequence based on standard maturity models:
I. Information
II. Interaction
III. Transaction
IV. Transformation
(A) II, I, III, IV
(B) I, II, III, IV
(C) I, III, II, IV
(D) III, I, II, IV

21. A key feature of DigiLocker is the generation of a dedicated URI for documents. What does URI stand for in this context?
(A) Unified Records Interface
(B) Universal Registration Identity
(C) Uniform Resource Identifier
(D) Unique Resource Indicator

22. Consider the following statements about the National e-Governance Plan (NeGP):
I. It was officially launched by the Government of India in 2006.

39. Which platform is referred to as India's National Telemedicine Service, enabling patient-to-doctor consultations?
(A) e-Sushrut
(B) CoWIN
(C) e-RaktKosh
(D) e-Sanjeevani

40. Which PAN-India satellite-based computer communication network was set up by NIC to connect all district headquarters?
(A) BSNL-NET
(B) SWAN-NET
(C) GOV-NET
(D) NICNET

41. The funding for the BharatNet project largely comes from which financial pool?
(A) Consolidated Fund of India directly
(B) Universal Service Obligation Fund (USOF)
(C) World Bank Rural Infrastructure Loan
(D) Corporate Social Responsibility (CSR) funds of IT companies

42. The Public Financial Management System (PFMS) is administered by which of the following authorities?
(A) Comptroller and Auditor General of India (CAG)
(B) Reserve Bank of India (RBI)
(C) Controller General of Accounts (CGA)
(D) NITI Aayog

43. Identify the correct pair regarding the Income Tax e-filing platform:
(A) ITR-1 - Applicable only for large corporate companies
(B) ITR-4 - Sugam form for presumptive income from business and profession
(C) Form 26AS - Form for applying for a new PAN card
(D) ITR-7 - Form for salaried individuals without any business income

44. What does the acronym PRAGATI stand for?
(A) Progress Report and Government Tracking Initiative
(B) Pro-Active Governance and Timely Implementation
(C) Public Relief and Grievance Accountability Tracking Interface
(D) Pro-Active Government and Timely Intervention

45. BharatNet aims to provide high-speed broadband connectivity to all:
(A) District headquarters exclusively
(B) Smart cities
(C) Gram Panchayats in the country
(D) Central Universities

46. Which biometric identifiers are currently captured for Aadhaar generation in India?
(A) Fingerprints and DNA mapping
(B) Fingerprints and Iris scans
(C) Iris scans and DNA mapping
(D) Iris scans, Fingerprints, and Voice mapping

47. What does the acronym DIKSHA stand for in the context of e-Education?
(A) Distance Information and Knowledge System for Higher Academics
(B) Digital Infrastructure for Knowledge Sharing
(C) Digital Initiative for Kids and School Healthcare
(D) Direct Integration of Knowledge and Study for Hindi Areas

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48. The National Informatics Centre (NIC) was established in which year to provide technology-driven solutions to the government?
(A) 1976
(B) 1988
(C) 1995
(D) 2002

49. The e-Hospital project, a Hospital Management Information System (HMIS), is an initiative developed by:
(A) National Informatics Centre (NIC)
(B) Indian Medical Association (IMA)
(C) World Health Organization (WHO)
(D) All India Institute of Medical Sciences (AIIMS) alone

50. Which older organization was replaced by the Government e-Marketplace (GeM) for public procurement of goods and services?
(A) Controller General of Accounts
(B) National Informatics Centre Services Inc (NICSI)

(C) Directorate General of Supplies and Disposals (DGS&D)
(D) Central Public Works Department (CPWD)

51. Which entity is the primary implementing agency for the BharatNet project?
(A) Reliance Jio Infocomm
(B) National Informatics Centre (NIC)
(C) NITI Aayog
(D) Bharat Broadband Network Limited (BBNL)

52. What is the primary objective of implementing PFMS in government financial administration?
(A) To collect income tax from citizens directly
(B) To manage and monitor the foreign exchange reserves and international assets of the country
(C) To facilitate and secure citizen-to-citizen digital payments via interoperable platforms
(D) To track funds released under plan schemes and ensure real-time expenditure reporting

53. The e-Courts project is conceptualized under the guidance of which judicial body?
(A) National Informatics Centre
(B) Ministry of Law and Justice alone
(C) The e-Committee of the Supreme Court of India
(D) Bar Council of India

54. The SWAYAM platform is primarily an initiative for:
(A) Hosting government datasets for public use
(B) Processing agricultural subsidies
(C) Providing massive open online courses (MOOCs)
(D) Managing smart city surveillance systems

55. Goods and Services Tax Network (GSTN) is designed to provide IT infrastructure for the rollout of GST. What is the organizational structure of GSTN?
(A) A Section 8 (not-for-profit) company
(B) A 100% Government of India owned statutory body under the Ministry of Finance
(C) A joint venture partnership established exclusively between various state governments
(D) A department functioning under the NITI Aayog

56. Which organization operates the Aadhaar Enabled Payment System (AePS), which is crucial for financial inclusion and DBT withdrawals at micro-ATMs?
(A) National Payments Corporation of India (NPCI)
(B) Reserve Bank of India (RBI)
(C) Unique Identification Authority of India (UIDAI)
(D) State Bank of India (SBI)

57. The PMGDISHA scheme targets digital literacy in India. The "G" in PMGDISHA stands for:
(A) Gramin
(B) Global
(C) Governance
(D) Growth

58. The 'MyGov' platform was launched with the primary objective of:
(A) Facilitating citizen participation and crowdsourcing for good governance
(B) Enabling the secure online trading and management of government-issued bonds
(C) Processing grievances of central government employees only
(D) Serving as a centralized online marketplace for high-volume public procurement

59. Under the Ayushman Bharat Digital Mission (ABDM), the unique ABHA (Ayushman Bharat Health Account) number consists of how many digits?
(A) 10 digits
(B) 12 digits
(C) 14 digits
(D) 16 digits

60. PRAGATI is a multi-modal platform aimed at addressing common man's grievances and simultaneously monitoring important programs. Who directly chairs the PRAGATI sessions?
(A) The President of India
(B) The Chief Justice of India
(C) The Union Cabinet Secretary
(D) The Prime Minister of India

61. The famous 'Bhoomi' project, heavily cited as an e-governance success story in India, deals with:
(A) Weather forecasting for farmers
(B) Rural health monitoring

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(C) Computerization of land records
(D) Digital literacy for tribal communities

62. The MP Tenders portal functions as the state's centralized mechanism for:
(A) Processing online e-procurement and digital bidding for government contracts
(B) Redressing the various grievances and complaints submitted by local farmers
(C) Applying for and renewing learner's and permanent driving licenses
(D) Registering vital life events such as births and deaths within the state

63. Pradhan Mantri Jan Dhan Yojana (PMJDY) directly tackles which major challenge in India?
(A) Financial exclusion of the unbanked population
(B) Lack of cyber security
(C) High illiteracy rates
(D) Delay in court case hearings

64. In Smart City infrastructure, IoT stands for Internet of Things. How does IoT directly benefit e-governance?
(A) By replacing human political leadership and decision-making with automated algorithms
(B) By providing free smartphones to citizens
(C) By collecting real-time sensor data from urban infrastructure to optimize civic operations
(D) By acting as a dedicated and secure virtual private network for government officials

65. Which of the following is the most appropriate description of Madhya Pradesh's 'Gyandoot' project?
(A) An intranet system connecting rural cyber cafes to the Dhar district administration.
(B) A state-wide broadband network exclusively for schools.
(C) A mobile app for direct benefit transfer of agriculture subsidies.
(D) A centralized digital library repository for the use of higher education students in Bhopal.

66. CERT-In, the national nodal agency for responding to computer security incidents as part of securing e-governance infrastructure, stands for:
(A) Computer Emergency Response Team - India
(B) Centre for Electronic Response and Technology in India
(C) Cyber Emergency Response Team of India
(D) Council of Electronic Records Tracking in India

67. Unified Payments Interface (UPI) operates under the regulation of which principal authority?
(A) Securities and Exchange Board of India (SEBI)
(B) State Bank of India (SBI)
(C) Reserve Bank of India (RBI)
(D) Finance Commission

68. The 'MP Online' portal is a joint venture between the Government of Madhya Pradesh and which private entity?
(A) Infosys
(B) Tata Consultancy Services (TCS)
(C) Wipro
(D) HCL Technologies

69. In the context of Smart Cities, the Integrated Command and Control Centre (ICCC) is best described as:
(A) A hub using IoT, AI, and analytics to manage civic services and emergencies
(B) A traditional local police station handling routine law and order situations
(C) A call center for rural agriculture queries
(D) A data storage facility used purely for archiving and indexing old physical files

70. Which international body publishes the e-Government Development Index (EGDI)?
(A) World Economic Forum (WEF)
(B) International Telecommunication Union (ITU)
(C) United Nations Department of Economic and Social Affairs (UN DESA)
(D) World Bank

71. Which of the following is considered the odd one out regarding Government to Business (G2B) digital services?
(A) e-Courts case status portal
(B) e-Procurement (GeM)

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delivery for caste and income certificates.
Effect: Which of the following is the most likely positive outcome?
(A) Substantial increase in rent-seeking behavior and administrative bribery
(B) Decrease in the number of applications due to fear of technology
(C) Reduction in turnaround time and removal of manual intermediaries
(D) Requirement of physical presence at multiple government offices

93. Which central portal acts as a single window for citizens to apply for various scholarships provided by central and state governments?
(A) e-Scholarship India
(B) Vidya Lakshmi Portal
(C) SWAYAM
(D) National Scholarship Portal (NSP)

94. A citizen uses an online dashboard to view the physical and financial progress of the construction of a nearby highway. This transparency is best associated with which outcome of e-governance?
(A) Digital exclusion
(B) Information asymmetry
(C) Open government and accountability
(D) Cyber surveillance

95. The 'e-Panchayat' Mission Mode Project is aimed at bringing governance to the grassroots. Which software application suite handles the accounting functions of gram panchayats under this project?
(A) PRIASoft
(B) PlanPlus
(C) ActionSoft
(D) LocalGov

96. Identify the incorrect statement regarding the RuPay payment system:
(A) It was developed by the National Payments Corporation of India (NPCI).
(B) It requires users to pay extremely high transaction fees compared to foreign networks.
(C) It aims to reduce the dependency on international card networks like Visa and MasterCard.
(D) It promotes financial inclusion by providing an affordable indigenous payment mechanism.

97. Which of the following is an example of a Government to Employee (G2E) e-governance initiative?
(A) Using an electronic HR management system (e-HRMS) for leave approval
(B) Filing of consumer court cases online via the dedicated e-daakhil portal
(C) Online application for a passport through the centralized Seva portal
(D) Companies registering on the MCA21 portal

98. Which government body was mandated to issue the National Digital Health ID (ABHA) under the Ayushman Bharat Digital Mission?
(A) National Medical Commission (NMC)
(B) National Health Authority (NHA)
(C) Indian Council of Medical Research (ICMR)
(D) Ministry of Ayush

99. The cloud computing initiative of the Government of India designed to accelerate the delivery of e-services while optimizing ICT spending is named:
(A) VayuCloud
(B) IndiaCloud
(C) NIC-Cloud
(D) GI Cloud (MeghRaj)

100. To ensure seamless functioning of multiple e-governance applications regardless of the language, the Government of India promotes localization. Which initiative focuses on making government services available in Indian languages through AI translation?
(A) BhashaSetu
(B) Anuvadak
(C) BharatVani
(D) Bhashini

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government and all state governments in one portal.
(B) It allows citizens to file RTI applications online to any central government ministry or department.
(C) It integrates a payment gateway for paying the RTI fee.
(D) It provides a facility to track the status of RTI applications.

83. What is the overarching objective of the e-Participation Index (EPI), which is published alongside the EGDI?
(A) Measuring the total amount of time citizens spend on various social media platforms daily
(B) Tracking and recording the number of mobile SIM cards registered to each individual citizen
(C) Evaluating the digital voting mechanism in national elections
(D) Evaluating citizen engagement and public consultation in policy-making via online tools

84. Blockchain technology is increasingly considered for e-governance systems due to its ability to provide:
(A) High-speed broadband connectivity for all rural and urban users
(B) Advanced natural language processing capabilities for localized apps
(C) Immutable, tamper-proof, and decentralized record-keeping
(D) Direct physical delivery of goods

85. The 'Vimarsh Portal' launched by the Government of Madhya Pradesh focuses on which specific sector?
(A) Rural healthcare
(B) Mining and geology
(C) School education and academic resources
(D) Police and public safety

86. The Open Government Data (OGD) platform (data.gov.in) is implemented under which policy framework?
(A) National Cyber Security Policy
(B) National Data Sharing and Accessibility Policy (NDSAP)
(C) Information Technology Act, 2000
(D) Personal Data Protection Bill

87. M-governance is considered a sub-domain of e-governance. The 'M' stands for:
(A) Macro
(B) Mobile
(C) Micro
(D) Managed

88. The UN e-Government Development Index (EGDI) is a composite measure comprising three primary indices. Which of the following is NOT one of them?
(A) Online Service Index (OSI)
(B) Cyber Security Readiness Index (CSRI)
(C) Telecommunication Infrastructure Index (TII)
(D) Human Capital Index (HCI)

89. Which of the following best represents an application of Artificial Intelligence (AI) in modern e-governance?
(A) Laying high-capacity optical fiber cables to ensure robust rural connectivity
(B) Using chatbots for 24/7 automated responses to citizen queries on a portal
(C) Providing modern desktop computers and hardware to all government officers
(D) Manually scanning paper documents into PDF format

90. In Madhya Pradesh, the Samagra Family ID consists of how many digits?
(A) 8 digits
(B) 9 digits
(C) 12 digits
(D) 14 digits

91. Identify the correct pair regarding Madhya Pradesh e-governance portals:
(A) RCMS - Online booking of state transport buses
(B) MP Bhulekh - Digital land records and maps management
(C) Vimarsh - Online payment of commercial taxes
(D) Sarthak - Online platform for e-tendering

92. Examine the following cause-and-effect scenario in e-governance:
Cause: Introduction of electronic service

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29. The online facility for filing corporate taxes or acquiring business licenses falls under which e-governance model?
(A) G2E
(B) C2G
(C) G2B
(D) G2C

30. Arrange the following major e-governance milestones in India in the correct chronological order of their launch:
I. Establishment of NIC
II. Launch of NeGP
III. Launch of DBT
IV. Launch of Digital India
(A) I, II, III, IV
(B) II, I, IV, III
(C) I, III, II, IV
(D) II, IV, I, III

31. The 'e-District' project primarily targets the computerization and delivery of which types of services?
(A) Direct benefit transfers for central government agriculture schemes like PM-KISAN
(B) Processing and management of diplomatic visa applications and international passport services
(C) High-volume district-level services like certificates, licenses, and social pensions
(D) Judicial case management at the Supreme Court level

32. The Passport Seva Project, one of the largest Mission Mode Projects under NeGP, is executed in Public-Private Partnership (PPP) mode with which IT major?
(A) Infosys
(B) Tata Consultancy Services (TCS)
(C) Wipro
(D) Tech Mahindra

33. In the Direct Benefit Transfer (DBT) scheme framework, the term "JAM Trinity" refers to:
(A) Justice, Administration, Management
(B) Jan Dhan, Aadhaar, Mobile
(C) Jan Dhan, Accounts, Money
(D) Joint Account Mechanism

34. The NDEAR architecture under the Ministry of Education stands for:
(A) Network for Digital Empowerment and Rural learning
(B) National Data Exchange for Academic Results
(C) New Digital Era Academic Reforms
(D) National Digital Education Architecture

35. Which of the following is NOT a component of the e-Courts case management system?
(A) Public Financial Management System (PFMS)
(B) Case Information System (CIS)
(C) National Judicial Data Grid (NJDG)
(D) Virtual Courts

36. Before being renamed as BharatNet, the project was known as:
(A) National Optical Fibre Network (NOFN)
(B) Rural Broadband Mission (RBM)
(C) Gramin Internet Pariyojana (GIP)
(D) Digital India Rural Network (DIRN)

37. Under the Aadhaar (Targeted Delivery of Financial and Other Subsidies, Benefits and Services) Act, 2016, what is the primary purpose of the 12-digit Aadhaar number?
(A) To act as a definitive proof of identity and residence for targeted delivery
(B) To act as a definitive proof of Indian citizenship
(C) To act as a substitute for a permanent account number (PAN) for all transactions
(D) To serve as an international passport equivalent

38. Under the e-Procurement framework, the adoption of digital tendering primarily results in:
(A) Reducing the transparency in the bidding process
(B) Increasing the geographical restrictions on bidders
(C) Significantly lengthening the total time required for manual tender approval
(D) Eliminating cartels while increasing transparency and competition

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ANSWERS

1. (A) Both A and R are true and R is the correct explanation of A.
Direct Benefit Transfer enhances transparency by transferring subsidies directly to bank accounts, eliminating middleman interference. This mechanism reduces leakage and delivery delays. Since transfers occur based on biometric identification through Aadhaar, only legitimate beneficiaries receive funds. This direct link ensures that government welfare schemes reach the intended recipients efficiently and securely without systemic corruption.

2. (C) Simple, Moral, Accountable, Responsive, Transparent
The SMART model represents the core values of modern digital governance. It emphasizes simple procedures, moral conduct of officials, and accountability to the public. Additionally, systems must be responsive to citizen needs while maintaining transparency in every transaction. This framework ensures that electronic administration improves service delivery and fosters trust between the government and its citizens.

3. (C) I, III and IV
Aadhaar provides a unique identification using demographic and biometric details like fingerprints and iris scans. While issued by UIDAI under the 2016 Act, it serves primarily as proof of identity and residence. It is explicitly not a document for establishing citizenship. This statutory framework enables targeted delivery of public subsidies and services to the correct individuals.

4. (C) 9
The Digital India initiative is built upon nine foundational pillars designed to transform the country into a digitally empowered society. These pillars include broadband highways, universal access to mobile connectivity, and public internet access programs. Other components focus on e-governance through technology, e-Kranti for electronic service delivery, and information for all to ensure comprehensive national digital growth.

5. (B) P-3, Q-4, R-2, S-1
Digital payment systems include UPI for real-time inter-bank transactions and BHIM as a mobile application for such payments. RuPay serves as a domestic card network developed by NPCI, while AEPS utilizes Aadhaar biometrics for banking operations. These technologies work together to promote a cashless economy by offering secure, interoperable, and accessible financial services to various population segments.

6. (B) 1 GB
DigiLocker provides users with a secure cloud-based platform for storing, sharing, and verifying essential documents and certificates. Initially, every standard user account is allocated one gigabyte of storage space. This digital repository reduces the need for physical documents during official transactions. Users can upload their own scanned copies or receive digitally signed certificates directly from registered issuers.

7. (B) I and II only
Government-to-Citizen models facilitate online public utility services like electricity bill payments and tax submissions. Government-to-Business interactions include e-procurement and digital corporate filings to improve the ease of doing business. However, Government-to-Employee models focus on internal administrative matters like payroll and leave management for civil servants, rather than focusing on international diplomacy or external bilateral relations.

8. (A) IV, I, III, II
The National e-Governance Plan was launched in 2006 to establish core infrastructure. This was followed by the establishment of the Unique Identification Authority of India in 2009 for Aadhaar. The MyGov platform for citizen engagement was introduced in July 2014. Finally, the comprehensive Digital India programme was officially launched in 2015 to integrate and expand all digital initiatives.

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secretaries and state chief secretaries via video conferencing. This direct oversight ensures that critical development projects are implemented on time and that systemic issues causing delays are addressed promptly.

61. (C) Computerization of land records
The Bhoomi project in Karnataka is a landmark e-governance initiative focused on the computerization of land records. It replaced the traditional manual system of maintaining land records with a digital database, making them easily accessible to farmers. This transparency has significantly reduced the potential for fraud and disputes, while also facilitating the quicker processing of bank loans and agricultural subsidies.

62. (A) Processing online e-procurement and digital bidding for government contracts
The MP Tenders portal is the centralized online platform for the Government of Madhya Pradesh to manage its procurement and tendering processes. It allows government departments to publish tenders and enables interested bidders to submit their proposals electronically. This system enhances the transparency and efficiency of public procurement by providing a secure and auditable digital environment, which helps in reducing intervention.

63. (A) Financial exclusion of the unbanked population
Pradhan Mantri Jan Dhan Yojana is a massive national mission for financial inclusion aimed at ensuring that every household in India has access to a bank account. By providing basic banking services to the unbanked population, PMJDY addresses the challenge of financial exclusion. These accounts serve as the foundation for the Direct Benefit Transfer system, allowing subsidies to be deposited directly.

64. (C) By collecting real-time sensor data from urban infrastructure to optimize civic operations
The Internet of Things plays a vital role in the development of Smart Cities by connecting various urban infrastructures through sensors and digital networks. IoT devices collect real-time data on traffic, waste management, water supply, and energy consumption. This information is then used by city administrators to optimize civic operations and improve service delivery, enhancing the overall efficiency and sustainability.

65. (A) An intranet system connecting rural cyber cafes to the Dhar district administration.
Gyandoot was an innovative rural e-governance project launched in the Dhar district of Madhya Pradesh. It established a community-owned intranet system that connected rural cyber cafes to the district administration. This allowed villagers to access important information and services like market prices for crops and grievance registration locally, making it a pioneering model for digital governance at the grassroots.

66. (A) Computer Emergency Response Team - India
CERT-In stands for the Computer Emergency Response Team - India. It is the national nodal agency responsible for responding to computer security incidents and protecting the country's critical information infrastructure. CERT-In provides early warning alerts, incident reports, and guidelines for enhancing cybersecurity. It plays a crucial role in maintaining the integrity and security of e-governance systems against cyber threats.

67. (C) Reserve Bank of India (RBI)
The Unified Payments Interface is a real-time payment system that facilitates instant inter-bank transactions through mobile devices. UPI operates under the regulatory oversight of the Reserve Bank of India, which ensures the security and stability of the digital payment ecosystem. Developed by NPCI, UPI has become a cornerstone of India's digital economy by providing a convenient and interoperable platform.

68. (B) Tata Consultancy Services (TCS)
MP Online is a prominent e-governance portal of the Government of Madhya Pradesh, established as a joint venture with Tata Consultancy Services. It provides a wide range of citizen-centric services, including university admissions, recruitment applications, and utility bill payments. Through its extensive network of kiosks, MP Online ensures that government services are accessible to the public in a transparent manner.

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17. (A) Ministry of Electronics and Information Technology
The Ministry of Electronics and Information Technology serves as the primary nodal agency for planning and implementing the Digital India programme. It coordinates with various central and state departments to ensure the deployment of digital infrastructure and services. By providing policy guidance and technical support, this ministry plays a central role in driving the nation's digital transformation and innovation.

18. (A) Both A and R are true and R is the correct explanation of A.
Digital documents stored in DigiLocker and issued by authorized agencies are legally equivalent to physical originals. This parity is established under the Information Technology Rules of 2016, which govern the preservation of electronic records. These rules ensure that digitally signed certificates can be used for verification across various government and private sectors, thereby reducing the dependency on paper-based documentation.

19. (D) G2G
The Government-to-Government model facilitates electronic communication and data exchange between different government departments or agencies. This interaction can occur at local, state, or national levels to improve administrative efficiency and policy coordination. By sharing information digitally, government bodies can reduce redundancy, streamline internal processes, and provide more cohesive services to the public while maintaining secure and structured communication.

20. (B) I, II, III, IV
e-Governance typically evolves through four distinct stages starting with information dissemination through static websites. The next stage is interaction, where citizens can download forms or communicate with officials. Transactional stages allow for complete online processing of services and payments. Finally, transformation occurs when administrative processes are fully redesigned and integrated using technology to deliver seamless, citizen-centric services across all levels.

21. (C) Uniform Resource Identifier
In the DigiLocker ecosystem, a Uniform Resource Identifier acts as a unique reference for every digital document. This string of characters identifies a specific resource, allowing it to be easily located and shared across different systems. The URI ensures that document verification is accurate and that different government platforms can interact seamlessly when requesting or providing digital certificates to users.

22. (B) V only
The National e-Governance Plan was launched in 2006 with thirty-one Mission Mode Projects covering various sectors. It utilizes infrastructure like SWAN and CSCs to ensure services reach every part of the country. Contrary to the idea of urban restriction, the plan specifically focuses on making all government services accessible to the common man in their local area nationwide.

23. (D) P-3, Q-1, R-2, S-4
Several Indian states pioneered digital governance through innovative projects. Bhoomi in Karnataka digitized land records, while e-Seva in Andhra Pradesh integrated utility payments. Kerala's FRIENDS project offered one-stop service centers, and Madhya Pradesh launched Gyandoot for rural intranet services. These initiatives paved the way for national programs by demonstrating how technology could effectively solve local administrative challenges and improvements.

24. (D) Private corporate Virtual Private Networks
The National e-Governance Plan is supported by three primary infrastructure components: State Wide Area Networks, State Data Centres, and Common Service Centres. These elements provide the connectivity, hosting environment, and service delivery points necessary for electronic administration. While private networks exist for corporate use, they are not part of the foundational government-led infrastructure designed to provide digital public services.

25. (A) III, IV, I, II
The architecture of e-governance begins with the foundational network layer providing connectivity. Above this lies the data layer where information is stored and managed. The application layer contains the software and

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43. (B) ITR-4 - Sugam form for presumptive income from business and profession
The Income Tax Department provides various forms for different categories of taxpayers. The ITR-4 form, also known as Sugam, is specifically designed for individuals and firms having presumptive income from a business or profession. Other forms like ITR-1 are for salaried individuals with simple income structures. Form 26AS provides a summary of taxes deducted at source for taxpayers.

44. (B) Pro-Active Governance and Timely Implementation
PRAGATI is a unique multi-purpose and multi-modal platform designed to bring transparency and accountability to government operations. It stands for Pro-Active Governance and Timely Implementation. The system allows for the simultaneous monitoring of important projects and the redressal of public grievances. By using data from various ministries, it facilitates high-level review meetings to ensure that development goals are met.

45. (C) Gram Panchayats in the country
BharatNet is a flagship mission of the Government of India aimed at providing high-speed broadband connectivity to over two hundred and fifty thousand gram panchayats. This massive rural connectivity project forms the backbone of the Digital India initiative. By extending optical fiber networks to the village level, BharatNet enables rural citizens to access a wide range of digital services.

46. (B) Fingerprints and Iris scans
The generation of an Aadhaar number involves the collection of specific biometric identifiers to ensure uniqueness. These include fingerprints from all ten fingers and scans of both irises. This biometric data, combined with demographic information, creates a robust identity record. Such multi-modal biometrics significantly reduce the risk of identity theft and ensure high accuracy during authentication for various services.

47. (B) Digital Infrastructure for Knowledge Sharing
DIKSHA stands for Digital Infrastructure for Knowledge Sharing. It is a national platform for school education that provides teachers and students with digital resources like e-books, training modules, and assessment tools. DIKSHA supports multiple Indian languages and is designed to be accessible across various devices. By facilitating knowledge sharing, it helps in standardizing the quality of teaching and learning.

48. (A) 1976
The National Informatics Centre was established in 1976 as the premier technology organization for the Government of India. Since its inception, NIC has played a pivotal role in the computerization of government departments and the implementation of various e-governance projects. It provides the necessary IT infrastructure, software solutions, and technical advisory services to central and state governments across India.

49. (A) National Informatics Centre (NIC)
The e-Hospital project is a Hospital Management Information System developed by the National Informatics Centre. This cloud-based platform helps in digitizing various hospital operations, including patient registration, pharmacy management, and laboratory reporting. By providing a centralized system for health records, e-Hospital improves the efficiency of healthcare delivery and allows patients to access their medical information digitally for better outcomes.

50. (C) Directorate General of Supplies and Disposals (DGS&D)
The Government e-Marketplace was launched to transform public procurement in India, replacing the older Directorate General of Supplies and Disposals. GeM provides a centralized online platform for the procurement of common-use goods and services by various government departments and public sector undertakings. This transition has increased transparency, reduced procurement time, and provided a level playing field for various suppliers.

51. (D) Bharat Broadband Network Limited (BBNL)
Bharat Broadband Network Limited is the primary implementing agency for the BharatNet project. BBNL was established as a special purpose vehicle under the Department of Telecommunications to oversee the creation and management of the optical fibre network. It coordinates with various public sector units and state governments to ensure the timely

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and scalable educational tools and platforms across India. By standardizing digital systems, NDEAR facilitates seamless knowledge sharing, improves the quality of teaching and learning, and supports the implementation of the National Education Policy.

35. (A) Public Financial Management System (PFMS)
The e-Courts project involves various technological tools like the Case Information System for tracking legal matters and the National Judicial Data Grid for real-time statistics. Virtual courts also facilitate online hearings. However, the Public Financial Management System is an administrative tool used by the executive branch for tracking government funds and expenditure, rather than being part of the judiciary.

36. (A) National Optical Fibre Network (NOFN)
Before being renamed BharatNet, the project was known as the National Optical Fibre Network. Launched with the goal of providing high-speed broadband connectivity to all gram panchayats, it forms the backbone of the Digital India programme. This infrastructure utilizes optical fiber to bridge the digital divide, enabling the delivery of various e-governance, e-health, and e-education services nationwide.

37. (A) To act as a definitive proof of identity and residence for targeted delivery
Under the Aadhaar Act of 2016, the 12-digit unique identification number is primarily used as proof of identity and residence for the targeted delivery of public subsidies and benefits. It ensures that government resources reach the correct individuals by using biometric authentication. Aadhaar does not grant citizenship or act as a substitute for an international travel document like a passport.

38. (D) Eliminating cartels while increasing transparency and competition
The adoption of electronic tendering and procurement systems significantly enhances the transparency of government contracts. By digitizing the bidding process, it reduces the possibility of manual manipulation and the formation of supplier cartels. This system encourages wider participation and competition from diverse geographical areas, leading to more cost-effective outcomes for the government while ensuring a fair and auditable process.

39. (D) e-Sanjeevani
e-Sanjeevani is India's flagship national telemedicine service that facilitates virtual consultations between patients and doctors. It provides two versions: one for provider-to-provider consultations and another for direct patient-to-doctor interactions. This digital healthcare initiative has been crucial in expanding medical access to remote areas, reducing the need for physical hospital visits, and ensuring the continuity of essential medical care.

40. (D) NICNET
NICNET is a comprehensive satellite-based computer communication network established by the National Informatics Centre. It connects all district headquarters, state capitals, and central ministries across India, providing the vital communication link for various e-governance applications. This network supports data exchange, video conferencing, and management of national databases, ensuring that administrative information flows seamlessly across different levels of government.

41. (B) Universal Service Obligation Fund (USOF)
The funding for the BharatNet project is primarily sourced from the Universal Service Obligation Fund. This fund is accumulated through a levy on the revenue of telecommunication service providers in India. The USOF is specifically dedicated to improving telecom infrastructure and services in rural and remote areas. By utilizing these resources, BharatNet aims to achieve universal broadband connectivity nationwide.

42. (C) Controller General of Accounts (CGA)
The Public Financial Management System is administered by the Controller General of Accounts under the Ministry of Finance. It acts as a centralized platform for tracking the release of funds and monitoring expenditure under various government schemes. PFMS ensures that financial transactions are transparent and accountable by integrating with bank systems for real-time reporting, thus improving overall financial efficiency.

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9. (B) Electronic delivery of services
Within the Digital India framework, e-Kranti is a vital pillar dedicated to the electronic delivery of services. It aims to transform government operations through technology by ensuring that public services are accessible digitally across the nation. This initiative focuses on service integration, security, and efficiency to provide a seamless experience for citizens while reducing manual processing and delays.

10. (C) P-1, Q-3, R-4, S-2
e-Governance models cater to different stakeholders through specific digital platforms. The G2C model includes grievance redressal for citizens, while G2B involves business registrations like the GeM platform. G2G focuses on inter-departmental connectivity via state networks, and G2E manages internal human resources for employees. These varied applications ensure that administrative processes are streamlined, transparent, and accessible to everyone within the ecosystem.

11. (D) Physical passport printing at home
The UMANG application offers a unified interface for accessing various central and state government services like EPF details and educational results. While users can track passport status or schedule appointments, the physical printing of passports at home remains impossible due to security protocols. Government identification documents require specialized printing and verification processes that are only conducted at authorized official centers.

12. (D) I, II, III, IV and V
Madhya Pradesh has implemented diverse digital initiatives like the 181 CM Helpline for grievances and Samagra ID for citizen identification. Projects like e-Uparjan streamline agricultural procurement, while RCMS manages revenue court records. Additionally, the Gyandoot project in Dhar district was a pioneering rural e-governance effort. Together, these systems enhance administrative efficiency and transparency in providing essential public services.

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13. (A) The use of ICT to transform government's relations with citizens, businesses, and other agencies.
e-Governance involves the strategic use of information and communication technology to improve the delivery of government services. It transforms interactions between the state and its citizens, businesses, and other agencies. By digitizing processes, it increases transparency, accountability, and efficiency. This concept goes beyond mere computerization, aiming for a fundamental shift in how the government operates and engages.

14. (C) P-3, Q-1, R-2, S-4
The PFMS tracks government fund releases, while the OGD platform provides open access to official datasets for transparency. The e-District initiative focuses on digitizing citizen services at the local level, and e-Courts manage judicial records through computerization. These components work together to build a robust digital infrastructure, ensuring that financial, legal, and administrative data are managed efficiently and transparently.

15. (D) A Special Purpose Vehicle (SPV) under the Companies Act
CSC e-Governance Services India Limited was established as a Special Purpose Vehicle under the Companies Act to oversee the Common Service Centres scheme. This organizational structure allows for professional management and implementation of digital services in rural areas. By acting as an intermediary between the government and service providers, the SPV ensures the sustainability and effective delivery of governance.

16. (A) II only
Digital India includes pillars like Broadband Highways for internet access and Universal Access to Mobile Connectivity for unconnected villages. However, e-Kranti is not focused exclusively on private corporate services. Instead, it emphasizes the electronic delivery of government services to citizens and businesses. This initiative aims to ensure that public benefits and administrative functions are available through digital channels.

deployment of broadband infrastructure across rural India.

52. (D) To track funds released under plan schemes and ensure real-time expenditure reporting
The primary objective of the Public Financial Management System is to provide a robust framework for tracking government funds released under various plan schemes. It ensures real-time reporting of expenditure and helps in the effective monitoring of budget utilization. By integrating with the banking system, PFMS facilitates the Direct Benefit Transfer of subsidies, thereby reducing delays and increasing financial transparency.

53. (C) The e-Committee of the Supreme Court of India
The e-Courts project is conceptualized and implemented under the guidance of the e-Committee of the Supreme Court of India. This committee provides the vision and strategic direction for the computerization of the Indian judiciary. The project aims to improve judicial productivity and make the legal system more accessible to citizens through digital services like online case status tracking.

54. (C) Providing massive open online courses (MOOCs)
SWAYAM is a flagship initiative of the Ministry of Education designed to provide massive open online courses to students across India. The platform hosts courses from school level to post-graduation, covering diverse subjects. It aims to bridge the digital divide for students who have remained untouched by the digital revolution and ensure high-quality educational resources are accessible to everyone.

55. (A) A Section 8 (not-for-profit) company
The Goods and Services Tax Network is organized as a Section 8 company. It was created to provide the complex IT infrastructure required for the implementation and operation of the GST regime in India. GSTN manages the common registration, return filing, and payment portals for both central and state tax authorities. This structure allows the organization to operate with technical flexibility.

56. (A) National Payments Corporation of India (NPCI)
The Aadhaar Enabled Payment System is operated by the National Payments Corporation of India. AePS allows bank customers to use their Aadhaar identity to access their bank accounts and perform basic banking transactions through micro-ATMs. This system is a critical component of India's financial inclusion strategy, enabling banking services at the doorstep for the unbanked and underbanked populations.

57. (A) Gramin
PMGDISHA stands for Pradhan Mantri Gramin Digital Saksharta Abhiyan. The "G" specifically signifies "Gramin," meaning rural. This scheme is focused on providing digital literacy training to six crore households in rural India. It aims to empower citizens by teaching them how to operate digital devices, browse the internet, and access various government services online, helping to bridge the digital divide.

58. (A) Facilitating citizen participation and crowdsourcing for good governance
The MyGov platform was launched to facilitate active citizen participation in the governance and policy-making processes of India. It serves as a crowdsourcing platform where individuals can share ideas, provide feedback on government initiatives, and participate in various tasks. By engaging the public in these activities, MyGov aims to foster a sense of partnership between the government and its citizens.

59. (C) 14 digits
The Ayushman Bharat Health Account number is a unique 14-digit identifier issued to citizens under the Ayushman Bharat Digital Mission. This number acts as a central key to an individual's digital health records, allowing for the seamless sharing and access of medical history across healthcare providers. ABHA helps in maintaining a comprehensive health profile, ensuring patients receive accurate medical care.

60. (D) The Prime Minister of India
PRAGATI is a unique monthly interactive platform that allows for high-level review of government projects and public grievances. These sessions are directly chaired by the Prime Minister, who interacts with central

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transparency and security help in building trust in public records and streamlining the property verification processes.

78. (D) Andhra Pradesh
The e-Seva project was a flagship initiative of the Andhra Pradesh government that revolutionized the delivery of citizen services through integrated digital counters. It allowed citizens to pay utility bills, apply for certificates, and access various other government services at a single location. This successful model of e-governance demonstrated the benefits of using technology to provide convenient and efficient services.

79. (B) Revenue court proceedings like mutation and demarcation
The Revenue Case Management System in Madhya Pradesh is designed to digitize and manage the proceedings of revenue courts across the state. It allows for the online filing and tracking of cases related to land mutation, demarcation, and other revenue-related disputes. By providing a transparent and auditable digital trail of court processes, RCMS helps in reducing delays and preventing manual interference.

80. (D) Transparent food grain procurement from farmers at the Minimum Support Price
The MP e-Uparjan portal is a specialized digital platform used by the Government of Madhya Pradesh to manage the procurement of food grains from farmers at the Minimum Support Price. It facilitates the online registration of farmers, scheduling of procurement slots, and direct transfer of payments into bank accounts. This system ensures transparency in procurement and helps in providing timely financial benefits.

81. (C) High digital illiteracy and the digital divide
High levels of digital illiteracy and the existing digital divide remain significant challenges to the widespread adoption of e-governance in rural India. While many government services have been digitized, a large portion of the rural population lacks the necessary skills to use these services effectively. Addressing this gap requires targeted digital literacy programs and the creation of accessible digital infrastructure.

82. (A) It covers public authorities under the central government and all state governments in one portal.
The RTI online portal is a centralized platform that allows citizens to file Right to Information applications to various central government ministries and departments. It includes features for online fee payment and tracking of application status. However, it does not provide a single window for all state government authorities, as many states have established their own independent portals and processes.

83. (D) Evaluating citizen engagement and public consultation in policy-making via online tools
The e-Participation Index measures how well governments use online tools to engage citizens in policy-making and administrative processes. It evaluates the availability of information, the opportunities for public consultation, and the involvement of citizens in decision-making through digital platforms. By tracking these factors, the index highlights the importance of fostering a more participatory and inclusive form of digital governance.

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84. (C) Immutable, tamper-proof, and decentralized record-keeping
Blockchain technology is highly valued in e-governance for its ability to provide immutable and tamper-proof record-keeping. The decentralized nature of blockchain ensures that data once recorded cannot be easily altered or deleted without the consensus of the network. This makes it an ideal solution for managing sensitive information like land records, identity data, and financial transactions where security is essential.

85. (C) School education and academic resources
The Vimarsh Portal launched by the Government of Madhya Pradesh is a dedicated platform for the school education department. It provides a range of digital resources for teachers and students, including academic materials, results management, and administrative tools for school operations. By centralizing educational data and resources, the Vimarsh Portal helps in improving the quality of teaching and learning.

69. (A) A hub using IoT, AI, and analytics to manage civic services and emergencies
The Integrated Command and Control Centre is a central hub in a Smart City that utilizes technologies like IoT, artificial intelligence, and data analytics to monitor urban services. It provides city officials with a real-time overview of traffic, public safety, and environmental conditions. During emergencies, the ICCC acts as a coordination center for disaster response, helping to optimize resources.

70. (C) United Nations Department of Economic and Social Affairs (UN DESA)
The e-Government Development Index is published biennially by the United Nations Department of Economic and Social Affairs. It serves as a benchmark for assessing the digital governance capabilities of various countries around the world. The index measures the readiness and capacity of national administrations to use technology to deliver public services. By providing comparative analysis, EGDI helps identify national strengths.

71. (A) e-Courts case status portal
Government-to-Business models specifically focus on the digital interaction between the state and the private sector. Platforms like the GeM for procurement, MCA21 for corporate filings, and the GSTN portal for tax returns are prime examples. In contrast, the e-Courts case status portal is primarily designed to provide information to individual litigants and the general public, rather than exclusively for businesses.

72. (B) An open API platform facilitating interoperability between different digital systems
API Setu is an open API platform launched by the government to facilitate interoperability and data exchange between different digital systems. It allows developers and government departments to securely access and share data through standardized application programming interfaces. By providing a common framework for integration, API Setu helps in the creation of a more connected and efficient e-governance ecosystem.

73. (D) Sarthak App
During the COVID-19 pandemic, the Madhya Pradesh government utilized the Sarthak App as a key digital tool for pandemic management. The application was used to track health data, monitor citizens under home quarantine, and manage the registration of frontline workers. By providing real-time information to health authorities, the Sarthak App played a crucial role in coordinating the state's response.

74. (C) Samagra ID
The Samagra ID is a unique identification number used in Madhya Pradesh to integrate various social security schemes and benefits at the citizen and family levels. It helps the government in accurately identifying beneficiaries and ensuring that welfare funds reach the correct individuals. By providing a centralized database of citizens, the Samagra portal streamlines administration and enhances transparency.

75. (D) Information Technology Act, 2000
The Information Technology Act, 2000 is the primary legal framework in India that provides recognition to electronic documents and digital signatures. It establishes the legal validity of electronic records and transactions, making them equivalent to physical counterparts for administrative and commercial purposes. The Act also provides a structure for addressing cybercrimes and ensuring the security of digital communication across platforms.

76. (D) Providing core banking overdraft facilities through the application
BHIM is a mobile application developed by NPCI that allows users to make instant digital payments using the Unified Payments Interface. It supports various features like scanning QR codes, sending money via bank accounts, and generating a secure UPI PIN. However, BHIM is primarily a payment interface and does not directly provide core banking services like overdraft facilities or personal loans.

77. (D) Maintaining land registry records to prevent fraud and forgery
Blockchain technology offers a decentralized and immutable ledger system that is highly suitable for maintaining permanent records like land registries. By using blockchain, the government can create a tamper-proof digital history of property ownership and transactions, which significantly reduces the potential for fraud. This

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logic that provide specific government services. Finally, the presentation layer serves as the user interface, allowing citizens and officials to interact with the system through various digital devices.

26. (D) IV only
UMANG is a comprehensive mobile application developed by MeitY to offer integrated access to diverse government services. While it is widely used on smartphones, the platform is designed to be inclusive and can be accessed on feature phones through methods like USSD or IVR. This ensures that even citizens without high-end mobile devices can benefit from digital governance.

27. (A) Village Level Entrepreneurs
Village Level Entrepreneurs are the primary operators of Common Service Centres across India. These individuals are local residents who manage the centers as a business venture, providing essential digital services to rural communities. They act as the vital link between the government's digital initiatives and the local population, helping citizens navigate online applications, bill payments, and various welfare scheme registrations.

28. (A) P-3, Q-4, R-1, S-2
India's digital ecosystem includes SWAYAM for online courses and PRAGATI for monitoring project implementation. e-Sanjeevani serves as a national telemedicine platform, while DIKSHA provides a digital infrastructure for teachers and students to share knowledge. These specialized platforms address needs in education, healthcare, and governance, leveraging technology to provide high-quality resources and efficient administrative oversight across the country.

29. (C) G2B
The Government-to-Business model involves electronic interactions between the state and the private sector. Services such as acquiring business licenses, filing corporate taxes, and participating in electronic procurement fall under this category. These digital initiatives aim to reduce administrative red tape, improve transparency, and enhance the ease of doing business by making regulatory compliance and government interactions faster and convenient.

30. (A) I, II, III, IV
India's e-governance journey began with the establishment of the National Informatics Centre in 1976. Decades later, the National e-Governance Plan was launched in 2006 to build core infrastructure. The Direct Benefit Transfer system was introduced in 2013 to streamline welfare payments. Finally, the Digital India programme was launched in 2015 to integrate these efforts and drive transformation.

31. (C) High-volume district-level services like certificates, licenses, and social pensions
The e-District project is a Mission Mode Project aimed at automating high-volume services delivered at the district and sub-district levels. This includes the issuance of certificates for birth, death, caste, and income, as well as the processing of social welfare pensions and licenses. By digitizing these essential functions, the project reduces the need for citizens to visit government offices repeatedly.

32. (B) Tata Consultancy Services (TCS)
The Passport Seva Project is implemented through a public-private partnership between the Ministry of External Affairs and Tata Consultancy Services. In this model, the private partner provides the underlying IT infrastructure and support services, while the government retains the core sovereign functions of verification and granting passports. This collaboration has significantly improved the speed and efficiency of passport services.

33. (B) Jan Dhan, Aadhaar, Mobile
The JAM Trinity represents the integration of three key components: Jan Dhan bank accounts, Aadhaar unique identification, and mobile connectivity. This combination forms a robust framework for financial inclusion and the Direct Benefit Transfer system. It allows the government to verify beneficiaries through Aadhaar and transfer subsidies directly into bank accounts, while mobile phones provide instant notifications and access.

34. (D) National Digital Education Architecture
The National Digital Education Architecture is a framework designed to strengthen the digital infrastructure of the education sector. It provides a blueprint for creating interoperable

NODIA

86. (B) National Data Sharing and Accessibility Policy (NDSAP)
The Open Government Data platform is implemented under the National Data Sharing and Accessibility Policy. This policy encourages government departments to proactively release non-sensitive datasets in machine-readable formats for public use. By making official data accessible to citizens and researchers, the OGD platform promotes transparency, innovation, and evidence-based policy-making. It serves as a vital resource for creating new applications.

87. (B) Mobile
In the context of e-governance, m-governance refers to the use of mobile technology to deliver government services and information to citizens. The "M" stands for "Mobile," highlighting the shift towards using smartphones and other handheld devices as the primary interface. m-Governance increases the accessibility and convenience of public services, particularly for populations in remote areas with high mobile penetration.

88. (B) Cyber Security Readiness Index (CSRI)
The United Nations e-Government Development Index is a composite measure based on three primary indices: the Online Service Index, the Telecommunication Infrastructure Index, and the Human Capital Index. These indices evaluate the quality of online services, the strength of the underlying digital infrastructure, and the level of education and skills. While cybersecurity is critical, it is not a core component.

89. (B) Using chatbots for 24/7 automated responses to citizen queries on a portal
Artificial Intelligence is increasingly used in e-governance to improve the efficiency and quality of public service delivery. One common application is the use of AI-powered chatbots on government portals to provide automated, 24/7 responses to citizen queries. These chatbots can handle a large volume of routine information requests, freeing up human officials to focus on more complex administrative tasks.

90. (A) 8 digits
In Madhya Pradesh, the Samagra Family ID is a unique 8-digit identification number assigned to each household. This ID is used as a foundation for managing and delivering various social security benefits to families across the state. By linking individual family members to this central ID, the government can better track the distribution of welfare services and ensure accuracy.

91. (B) MP Bhulekh - Digital land records and maps management
The MP Bhulekh portal is the official platform for the Government of Madhya Pradesh to manage digital land records and maps. It allows citizens to view and download their land records and related documents online. This initiative has brought greater transparency and convenience to land management, reducing the need for citizens to visit revenue offices for routine document verification.

92. (C) Reduction in turnaround time and removal of manual intermediaries
The introduction of electronic service delivery for essential documents like caste and income certificates leads to a significant reduction in turnaround time. By automating the application and approval processes, the system eliminates the need for manual intermediaries and reduces the potential for bribery and administrative delays. This shift towards digital services makes government interactions more efficient and transparent for citizens.

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93. (D) National Scholarship Portal (NSP)
The National Scholarship Portal acts as a single window for students to apply for various scholarship schemes offered by different central and state government departments. It streamlines the entire process from application submission to the final disbursement of funds through the Direct Benefit Transfer system. By providing a centralized platform, the NSP ensures that scholarships are delivered transparently and efficiently.

94. (C) Open government and accountability
When a government provides online dashboards for citizens to monitor the progress of public works, it promotes the principles of open government and accountability. This transparency allows the public to see how financial resources are being spent and whether projects are being completed on schedule. By making this information

available, the government fosters greater trust and encourages active citizen oversight.

95. (A) PRIASoft
Under the e-Panchayat Mission Mode Project, PRIASoft is the specialized software application designed to handle the accounting functions of gram panchayats. It enables local governments to maintain their financial records, track expenditures, and generate various financial reports in a standardized digital format. By digitizing rural accounting, PRIASoft enhances the transparency and accountability of financial management at the grassroots level.

96. (B) It requires users to pay extremely high transaction fees compared to foreign networks.
RuPay is an indigenous card payment network developed by the National Payments Corporation of India to provide an affordable alternative to international networks. Contrary to the idea of having high fees, RuPay is designed to have lower transaction costs, making it more accessible. This initiative promotes financial inclusion and reduces the dependency on foreign payment systems for domestic digital transactions.

97. (A) Using an electronic HR management system (e-HRMS) for leave approval
Government-to-Employee initiatives focus on improving internal administrative processes for the benefit of government workers. An example is the use of an electronic Human Resource Management System for tasks like leave approval, payroll processing, and performance tracking. By digitizing these HR functions, the government can streamline its internal operations, latitude paperwork, and provide more efficient services to its own workforce.

98. (B) National Health Authority (NHA)
The National Health Authority is the government body mandated to implement the Ayushman Bharat Digital Mission and issue the unique ABHA health IDs. The NHA is responsible for creating and managing the digital health infrastructure required for the mission, including the national health record system. By providing an interoperable platform, the NHA aims to improve the quality of healthcare delivery.

99. (D) GI Cloud (MeghRaj)
The Government of India's cloud computing initiative is named GI Cloud, also known as MeghRaj. This project is designed to accelerate the delivery of e-services by providing a common cloud infrastructure that can be used by various government departments. By centralizing ICT resources, MeghRaj helps in optimizing government spending, improving scalability, and fostering a more efficient technological environment for governance.

100. (D) Bhashini
Bhashini is a flagship AI-led initiative of the government aimed at making digital services and information accessible in all major Indian languages. By using advanced artificial intelligence and natural language processing, Bhashini provides tools for real-time translation and voice-based interaction. This localization effort ensures that citizens can access government portals in their native languages, thereby promoting comprehensive digital inclusion.

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